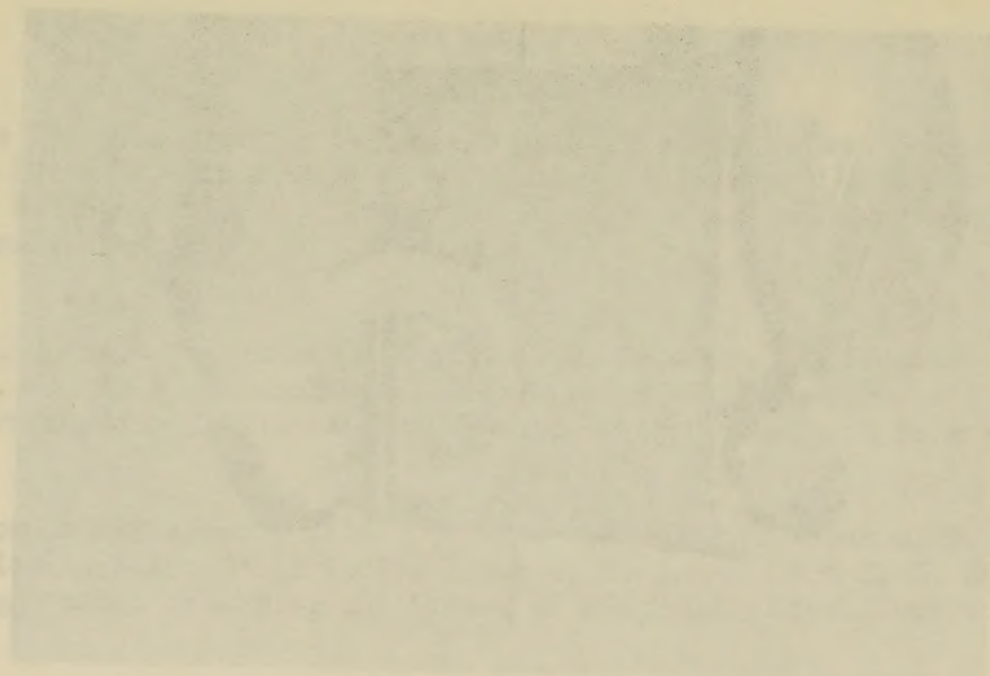
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN UTILIZATION RESEARCH BRANCH

THIRD COTTONSEED PROCESSING CLINIC

15-16 FEBRUARY 1954

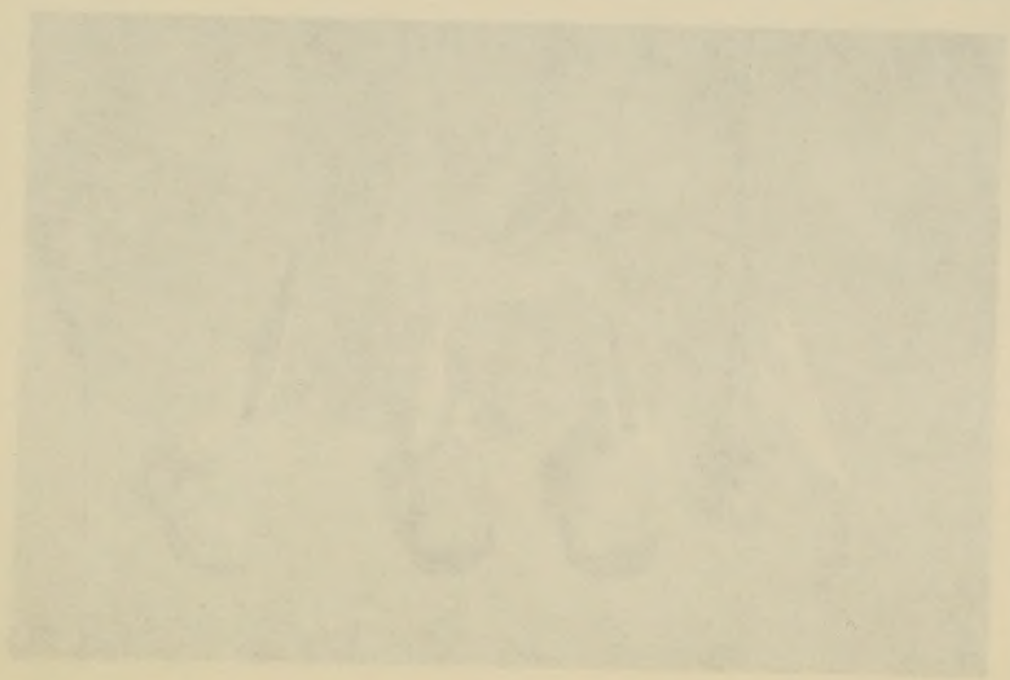
AT THE
SOUTHERN REGIONAL RESEARCH LABORATORY
NEW ORLEANS, LOUISIANA
IN COOPERATION WITH
VALLEY OILSEED PROCESSORS' ASSOCIATION

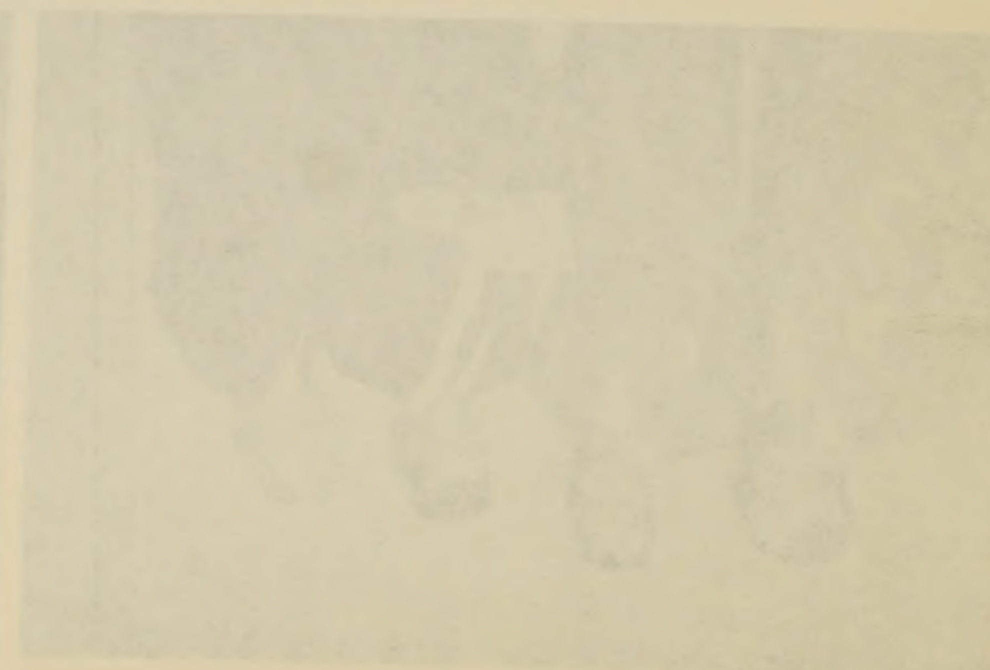


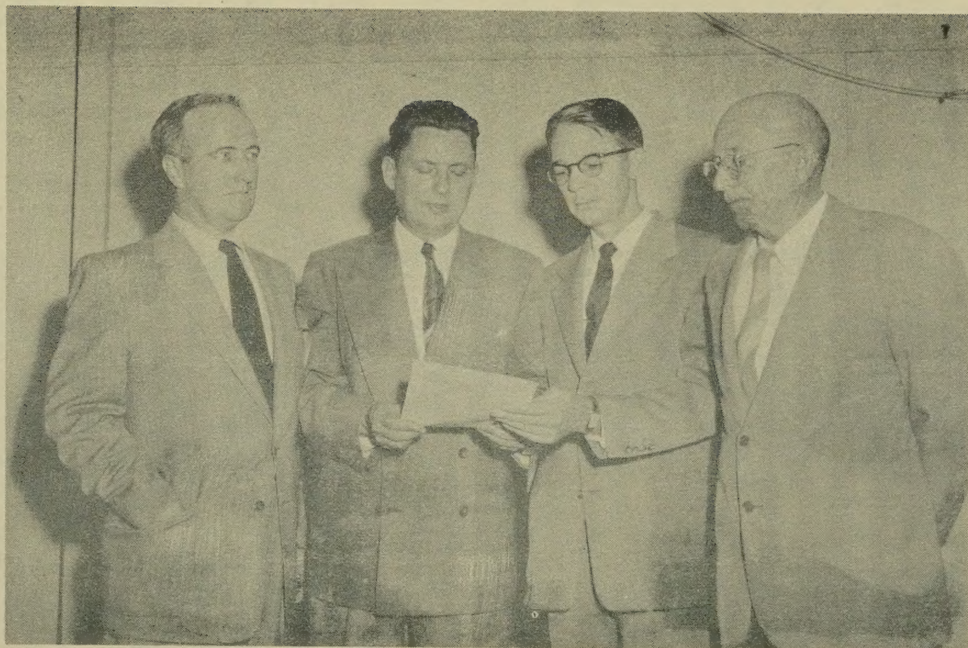
Upper Left: Discussing [illegible] being [illegible] at the Southern Regional Research [illegible] (left) J. [illegible] Holmes, Memphis, Tennessee, [illegible] and Dr. F. G. [illegible]

Upper Right: (Left to right) [illegible] Chicago, Illinois [illegible] F. K. Brown, Jr., [illegible] Third Cottonseed [illegible] New Orleans, Louisiana, February 13-14.

Bottom: At the Third Cottonseed [illegible] Laboratory in New Orleans February [illegible] Starkville, Miss., discuss the [illegible] over the past ten years.








$35,000,000

Upper Left: Discussing methods for processing cottonseed at the Third Cottonseed Processing Clinic at the Southern Regional Research Laboratory in New Orleans February 15-16, are (left to right) J. F. Moloney, Memphis, Tennessee, H.L.E. Vix, New Orleans, Louisiana, A. C. Wamble, College Station, Texas, and Dr. F. H. Thurber, New Orleans, Louisiana.

Upper Right: (Left to right) M. C. Verdery, Houston, Texas, J. H. Brawner, New Orleans, Louisiana, J. W. Bremer, Jr., Chicago, Illinois, and C. R. Campbell, Dallas, Texas, discuss the production and use of linters at the Third Cottonseed Processing Clinic at the Southern Regional Research Laboratory, New Orleans, Louisiana, February 15-16.

Bottom: At the Third Cottonseed Processing Clinic held at the Southern Regional Research Laboratory in New Orleans February 15-16, Allen Smith (left) Memphis, Tennessee, and C. C. Speakes, Stoneville, Miss., discuss the average annual return to the farmer of $35,000,000 for linters over the past ten years.

F O R E W O R D

These proceedings are a summary of the information presented at the Third Cottonseed Processing Clinic held at the Southern Regional Research Laboratory, New Orleans, Louisiana, February 15-16, 1954.

This working conference, sponsored jointly by the Southern Regional Research Laboratory and the Valley Oilseed Processors' Association, was attended by seventy-four representatives of cottonseed oil mills, equipment manufacturers, users of cottonseed products, and state and federal agencies, in addition to staff members of the Southern Laboratory. The program for the first day was arranged and conducted by staff members of the Southern Laboratory and for the second day by officials of the Association.

Major attention at the Clinic was focused on the production and use of linters.

CONTENTS

C O N T E N T S (cont'd.)

W E L C O M E

By
C. H. Fisher, Chief
Southern Utilization Research Branch

When I welcomed you to the Southern Laboratory on the occasion of the first Cottonseed Processing Clinic, I stated that I knew the Clinic would benefit us at the Southern Laboratory, and that I hoped you would profit from it too, and would want to visit us again. It is indeed a pleasure to be able to welcome you to the third such clinic and to express the hope that you will continue to visit us in the future.

We in the Southern Laboratory believe in research as the basis for a sound long range program for agriculture. Cooperation between government research groups, associations, universities and industry will be its keynote. Conferences such as this clinic are one of the best and most useful expressions of such cooperation.

On the first day of this clinic, the members of the Laboratory staff will give progress reports on the present status of research progress of particular interest to the cottonseed industry. The second day's program, presented by your association, will feature the problem of improving linter quality. For their help in arranging the program for this conference, I should like to thank the officers of Valley Oilseed Processors' Association and the members of Southern Regional Research Laboratory.

I shall look forward to seeing you at another clinic next year. In the meantime you are also cordially invited to visit us at any time to discuss research and offer suggestions.

R E S P O N S E

By
Ralph Woodruff, President
Valley Oilseed Processors' Association
Osceola Products Company

Thank you Dr. Fisher.

On behalf of the Valley Association and all who are cooperating with us in this endeavor, we want you to know that we appreciate very much this opportunity of meeting with you and your staff again.

It has been my good fortune to have been meeting here at the laboratory at various times and in various types of meetings and conferences for some six or eight years. I know of no place where arrangements are handled quite so well; where you feel more at home and where you get more done than here at the Southern Regional Research Laboratory.

We have gotten a large measure of benefit from our studies and our work here and it has meant a great deal to us to come here. I am certain that for generations to come, men in the oil mill business, as well as in other types of processing in the South, will be using profitably the services and facilities of this great Laboratory.

We thank you and your staff for what you have already done and for what you will do for us during the next two days.

We assure you that we are glad to be here.

SOUTHERN REGIONAL RESEARCH LABORATORY PRESENTATIONS ON COTTONSEED RESEARCH

AND

GUEST DISCUSSIONS OF INDUSTRY PROBLEMS

NEWER KNOWLEDGE ABOUT COTTONSEED PROCESSING AS IT AFFECTS THE QUALITY OF THE OIL AND MEAL

By
A. M. Altschul
Southern Regional Research Laboratory

For the last several years there has been underway a comprehensive program of research on the processing of cottonseed as it affects the quality of the meal and oil. Participating in this program have been research workers in federal, state, and industrial institutions. This program has enjoyed the wholehearted cooperation of the cottonseed products industry, its member mills, and its official organization, the National Cottonseed Products Association, its Educational Service, and its fellowship program. It is the purpose of this discussion to bring to you some of the results that have come out of this program in the last year.

We have a better idea of the factors that determine the quality of cottonseed oil and meal. The most important quality factor in cottonseed oil is the color of the refined and bleached product that is attained at minimum loss. In the last year we have demonstrated that the presence of gossypol in the oil has a profound influence on color reversion of the crude oil between the time that it is made and the time that it is refined. This was demonstrated by removing gossypol during the cooking operation prior to production or from the oil immediately after its production. In both of these instances crude oils were produced which were completely stable to color reversion upon storage.

It is generally agreed that cottonseed meal is good for cattle feeds and that the conditions of production have little influence on its value for this purpose. In looking for broader markets in the poultry and swine feeds there are certain quality factors that must be maintained. These are: (1) a minimum concentration of materials that interfere with growth and (2) the preservation of protein quality. Events within the last year have allowed us to make a firmer statement about the concentration of free gossypol in cottonseed meal which interferes with growth. There is general agreement that cottonseed meal containing 0.04% or less of free gossypol can be fed safely in all concentrations to growing poultry and swine. Such meals, however, cannot be fed to laying hens because they cause egg yolk discoloration in the stored eggs. This does not mean that gossypol in the meal is the only factor that interferes with growth or that we know the entire picture. But it does mean however, that this is the measure that has consistently given us satisfactory relationship with interference with growth.

The second meal quality factor is not so easy to define. It is the extent of damage or lack thereof that has occurred to the protein during processing. The measure which seems to approximate more closely the measure of heat damage is the solubility of the nitrogen in 0.02 normal alkali. The greater the solubility, the less is the heat damage. Tentatively it has been felt that meals that have a nitrogen solubility greater than 75% are definitely better sources of protein than those below 75 percent in solubility.

On the basis of these quality factors for oil and meal it can be said that the hydraulic press method of processing produces high quality oils but produces meals of free gossypol content usually too high to be used for swine and poultry. The screw press method produces inferior oils to those with the hydraulic press method but usually produces meal of free gossypol content

below .04%. Generally, however, the meals are overheated and the protein quality has been damaged. The prepress solvent extraction technique produces oils that are inferior to the hydraulic press oils but the meals have low free gossypol content and many of them have experienced a minimum of protein damage. Thus these meals would seem to be among the best that are available commercially for extended utilization. A blanket statement about straight solvent extracted meals cannot be made because there is no standardization of the procedures in the commercial processes.

Investigation of all of these processes and their shortcomings has indicated that the most important work that could be done to improve the quality of the products from the present processes is to understand more about what happens during the cooking operation and to introduce modifications therein which would allow the production of high quality oil and meal by whatever method of oil extraction is practiced. Research has been underway at this Laboratory on the fundamentals of cooking and there is some evidence that when the cooking is modified in such a way as to rupture all the pigment glands (use of moisture contents above 22 percent in the cooker) and when acid and alkali are added, meals of superior nutritive value are produced. There is a tentative conclusion that is now being subjected to a rigorous experimental verification. When alkali is used in the cooker it seems that the oil produced has no gossypol and is stable to color reversion upon storage of the crude oil.

Another approach to this problem is to develop a chemical method of treating the oil immediately on extraction to precipitate the gossypol. This work has also been accomplished in the Laboratory using para-aminobenzoic acid which is a very effective precipitant of the gossypol. In order to be commercially feasible this practice would have to involve the use of much cheaper precipitants.

The investigations on improving the nutritive value of cottonseed meal were spurred on by two nutrition conferences held at this Laboratory in November 1950 and 1951. As a result of these efforts the problems became more clearly defined. These efforts culminated in the last conference held in November 1953, in which it was possible to make a clear-cut definition of the status of cottonseed meal nutrition. The following is quoted in its entirety from the Proceedings of the Semi-Annual Meeting of the Nutrition Council of the American Feed Manufacturers' Association held November 30 to December 1, 1953.

> "A Cottonseed Meal Nutrition Research Conference was held November 9 to 11, 1953 at New Orleans. The meeting was sponsored by the Southern Regional Research Laboratory and the National Cottonseed Products Association and was attended by workers in the field from colleges, experiment stations, and the industry. The following conclusions were formally adopted at the close of the Conference by those in attendance:
>
> > "Results presented thus far indicate that rations containing cottonseed meal and soybean meal in equal proportions on a nitrogen basis are equal or superior to rations based on either cottonseed meal or soybean meal alone, when the cottonseed meal was 0.04 percent or less of free gossypol and 75 percent or more of nitrogen solubility in 0.02 normal sodium hydroxide solution.

"Preliminary indications are insofar as free gossypol is concerned, that cottonseed meal having 0.04 percent or less of free gossypol can be fed in unrestricted proportions in balanced diets for chicks, broilers, and swine.

"Because this research work implies additional use by feed manufacturers of cottonseed meal in poultry and swine feeds, it was decided to appoint a cottonseed subcommittee headed by Dr. Leo Curtin. The purpose of this subcommittee is to more closely correlate the research and development by the cottonseed meal producers and government agencies with the requirements of the feed industry. The subcommittee plans to present a display of cottonseed meal samples at the May 1954 meeting for preliminary evaluation of the Nutrition Council. These samples will include solvent, hydraulic, and expeller processed meals. They will be divided into two categories, one suitable for swine and poultry and the other for ruminants. Meals of various protein analyses will be available. The objective will be to submit to the processor final samples representative of the entire council preference for their guidance."

Thus you can see a concrete practical demonstration of the effect of research on the quality of cottonseed meal. We consider that the 1953 meeting was a milestone in the progress of increasing utilization of cottonseed meal and represented the culmination of the efforts of many for several years to bring about a reopening of the cottonseed meal question and a broadening through research of its potential for utilization.

Discussion

Verdery: In referring to the prepressed meal as the best of the three meals discussed, do you mean it is the best after it has been solvent extracted?

Altschul: Yes.

Allen Smith: Where heat is the bad boy in the game, is it heat in the processing of oil or of the meal?

Altschul: Most of the heat damage took place in the barrel of the press.

Newby: In connection with solvent extracted meals is there any information on feeding meals with added acidulated soap stock? Ammoniated soap stock?

Altschul: Fine pellets have been made from meal with added acidulated soap stock. Preliminary information from Dr. Lyman on acidulated soap stock is that it does not harm the feed value of meals.

LABORATORY EXPERIMENTS ON COOKING OF COTTONSEED TO PRODUCE IMPROVED MEALS AND OILS

By
F. H. Thurber
Southern Regional Research Laboratory

Different processing procedures are required for cottonseed than for other oilseeds because cottonseed contains pigment glands. The chief component of these glands is gossypol and other similar pigments. These pigments

interfere with the nutrition of swine and poultry and are responsible for color reversion in cottonseed oil. Accordingly, it would appear that the objective in processing cottonseed should be to produce a good oil and to either remove or inactivate gossypol without lowering the nutritive value of the protein by excessive heating or by any other means.

Laboratory experiments are underway to aid in attaining this objective. An essentially gossypol-free meal was prepared to serve as a standard in chick feeding studies. In making this meal the oil was first extracted with hexane and followed by a second extraction with butanone to remove gossypol. The protein efficiency of this meal (determined by chick feeding studies) was assigned an arbitrary index value of 100. On this scale many commercial meals range in nutritive value from about 40 to 90. In another laboratory experiment the effect of variations in pH during the cooking of cottonseed meats is being studies. To date the best results have been obtained by rolling the meats, breaking the pigment glands by vigorous stirring of the meats with about 35 percent of water containing bases or acids, in a mixer modified to produce the required mechanical action, followed by drying at a maximum temperature of about 212°F. Oil was extracted with a laboratory type solvent extraction apparatus. When approximately 0.5 percent alkali (NaOH), based on the weight of the meats, was used in the cooker, many of the meals had an index value of about 120 and free gossypol contents below 0.03 percent. Similar values were obtained when a small amount of phosphoric acid was used although the free gossypol content was higher. Crude oils from the alkali cooks were essentially free from gossypol and were not subject to color reversion.

Discussion

Bremer: Did the animals accept the meals with high alkali and low acid pH's? Did they eat them all right?

Thurber: Yes, so far. The animals were hungry after the 10 day period of low protein diet.

Newby: On the basis of the weight of meats, what percent of NaOH did you use?

Thurber: On the basis of the meats, about 3/4 of 1 percent.

K. B. Smith: Referring to the cooked meats, how were they prepared, flaked, rolled, whole or ground?

Thurber: Here we added lots of water and it didn't make much difference. The meats were flaked in pilot plant rolls to a thickness of about 0.010 inch.

LABORATORY EXPERIMENTS ON THE USE OF SPECIAL REAGENTS TO IMPROVE THE COLOR OF COTTONSEED OIL

By
J. M. Dechary
Southern Regional Research Laboratory

Almost 25 percent of the crude cottonseed oils now received at the refineries are difficult to refine and bleach satisfactorily by existing procedures. This situation is primarily caused by the rapid change to screw-press and prepress solvent extraction procedures which extract a greater percentage of the cottonseed pigments with the oil. Storage of these crude oils for long periods of time at elevated temperatures promote the conversion of the alkali-soluble pigments into alkali-insoluble forms with consequent difficulties in the refining and bleaching operations.

The removal of gossypol, the principal pigment of crude cottonseed oil, by treating freshly prepared oil with p-aminobenzoic acid and separating the di-p-carboxyanilino-gossypol formed, permits the storage of the oil at an elevated temperature for an extended period of time (100°F. for 30 days) without incurring adverse changes in the refining and bleaching properties of the oil. In addition, a considerable apparent decrease in the refining loss of the oil is obtained, and the stability of the refined and bleached oil is not affected by the treatment.

Discussion

Bremer: What is the cost of p-aminobenzoic acid?

Dechary: $1.71 per pound in 100 pound lots, or 1 pound of oil with 1 percent of gossypol would cost about 0.7 cents per pound.

Allen Smith: Would the refiner be willing to bear the cost of adding the p-aminobenzoic acid to the crude oil at the mill?

Dechary: I do not know.

SCREW PRESSING OF COTTONSEED*

By
A. Cecil Wamble
Texas Engineering Experiment Station

(The following is a summary of the paper presented by Mr. Wamble at the Clinic.)

Introduction:

A comprehensive study of the screw press method of extracting cottonseed oil was made by the Cottonseed Products Research Laboratory of the Texas Engineering Experiment Station. This paper is actually Part II of a complete report covering the study. It gives a condensed version of the experimental program, describes the results obtained, shows how various factors affect mill operations, and serves as a guide or set of recommended standards of operation for screw press mills processing cottonseed.

The results of the work show that screw press mills which process cottonseed with inadequate rolling and cooking capacity can improve the operations by increasing these facilities. This is a significant accomplishment of the work. Some of the other important conclusions of the investigation which have practical application are:

1. The most pronounced factor affecting oil yield is the amount of power applied per ton of cottonseed pressed;
2. The condition of the cooked meats determines to a large extent how much power can be applied;
3. Screwpress capacity can be increased by raising the screwspeed if cooking and other facilities are adequate;
4. Oil quality is substantially affected by the thickness to which the meats are rolled prior to cooking. Quality is very much improved when thin flakes are pressed;

---

* A report of work done under contract with the U. S. Department of Agriculture and authorized by the Research and Marketing Act of 1946. The contract was supervised by the Southern Regional Research Laboratory of the Bureau of Agricultural and Industrial Chemistry.

5. Oil quality improves with increase in throughput;

6. The tendency of oils to increase in color upon storage (known as color reversion) differs widely according to seed and processing conditions, the amount of reversion being associated with the amount of gossypol in the seed;

7. Certain oils when refined immediately have better refining losses and colors than when refined as little as 24 hours after expression, and there is some indication that these oils may be characterized by high gossypol content;

8. Recycling the solid materials removed from the oil by settling and filtration (known as foots) through the cookers may cause a substantial rise in oil color;

9. Leakage or accidental introduction of certain gear lubricants into cottonseed oil will cause a significant increase in oil color even though present in extremely small amount:

10. Lowered maintenance cost can be obtained by reducing the amount of gritty materials left in the meats, and wear appears to be a function of the power consumed in the press rather than the quantity of cottonseed processed.

The recommended standards of operation of screw press mills for processing cottonseed include suggestions on the following items: (a) selection of equipment; (b) preparation of meats; (c) screw pressing; and (d) oil handling.

In 1951-52 season there were 5,476,555 tons of cottonseed crushed in the United States. It is conservatively estimated that oil yields could be increased 2.5 pounds per ton of cottonseed by using methods pointed out in this report. Based on the 1951-52 season when 31.6 percent of the cottonseed crushed, or 1,728,397 tons, were handled by screw presses, this would amount to 4,320,993 pounds of oil. At 12.5 cents per pound this would amount to $540,124 additional revenue. This does not take into account the improvement in oil quality, which is somewhat harder to estimate, nor savings due to increased throughput, which would together account for considerable increase in the net revenue. These benefits are in addition to others described.

Suggestions for Further Research Include:

a. Factors dealing with preparation such as (1) determining the effect of rolling cottonseed meats to different thicknesses at various levels of added moisture on the yield and quality of oil and meal, (2) comparing rolling with five high rolls to rolling with fewer than five rolls and also grinding the meats instead of rolling, (3) studying means of improving the efficiency of cookers by use of direct live or superheated steam and possibly forced air in the drying stage;

b. Studies on foots handling such as (1) determining the effect of time of contact and temperature on the quality of the oil in contact with screw press foots from screening tanks and filter cake, (2) determining whether mixing foots with raw rolled meats is more harmful than keeping the foots separate until entering the cooker, since many mills recycle the foots via the rolled meats bin, (3) investigating the possibility of using some type of continuous filter, foots press, centrifugal or other means to reduce the length of contact time if this proves to be an important factor, (4) investigating means of recovering oil from foots without passing this material back through the cooker;

c. Studies on oil handling such as (1) determining the fundamental reasons why some oils revert rapidly in color while others do not, why immediate refining benefits only some oils and why screw pressed oils are different from hydraulic oils, (2) determining whether it might be possible to arrest color reversion

through the addition of an approved anti-oxidant, (3) determining by further studies the relationships of oil storage temperature and time to oil quality.

Special Comments: In addition to the information collected during this study of the screw pressing of cottonseed other material out of the experience of well qualified operators has been included in the recommended standards of operation of screw press mills for processing cottonseed.

A set of standards of operation should be followed by each mill operating screw presses. This does not mean that every mill should follow the same set of standards or that the same mill should follow the same operating plan under every set of conditions. Because there are so many things that differ in each mill and from time to time in the same mill, the standards of operation of screw press mills for processing cottonseed given here covers a range which probably includes the best operating conditions for a large number of screw press mills.

Many existing screw press mills have limiting conditions which make operating under other conditions which would improve results impossible. For example, many screw press mills cannot roll their meats thin enough because they do not have crushing rolls of the proper type and size, others do not have rolling and cooking capacity enough to permit them to take advantage of increased capacity which the screw presses are capable of, and others may not have large enough motors on the screw presses to take full advantage of loading the screw presses to their best operating condition. Operating standards should be flexible enough to be useful to mills that choose to operate the equipment they have as well as those that remove their bottle necks by installing the necessary equipment.

Discussion

Perry: Did you find or notice any difference between individual cooks?

Wamble: That is not covered in this paper. I will say, however, that the mills getting the best results have a 5-high cooker and are cooking like a hydraulic cook except that they are drying a little more.

Newby: You mentioned that small amounts of lubricants affect the oil, can you mention any test that can detect small amounts of lubricant?

Wamble: No, other than the regular test of the chemist. That is noticing the "Bloom."

Bremer: What was the horse power? We use 90 hp. Is it for each shaft or the total?

Wamble: It is the total horse power for two shafts. We use 80-85 hp.

CURRENT STATUS OF THE COMMERCIAL APPLICATION OF FILTRATION-EXTRACTION TO COTTONSEED AND SOYBEANS

By
H. L. E. Vix
Southern Regional Research Laboratory

The first commercial plant based on the Southern Regional Research Laboratory's filtration-extraction process has been designed, constructed, erected, and placed into operation by the Lukens Steel Company at the Planters Oil Mill (Hydraulic Mill, Greenwood, Mississippi) of the Mississippi Cottonseed

Products Company. The plant is rated to handle 150 tons of cottonseed or 75 tons of soybeans per 24 hours.

On January 26, 1954, the plant began to function, processing cottonseed (138-150 tons per 24-hour day) in accordance with the expectations of the pioneers of filtration-extraction. Since that time the plant has operated continuously (test runs of 7-8 days duration) on an essentially trouble-free basis. Important achievements have been the production of completely desolventized oil and meal products, an oil comparable to hydraulic pressed oil, an oil gain of 5000 to 6000 pounds per day over standard hydraulic operations, and a meal product with approximately 1% residual oil. After the completion of some modifications, principally on drives, transmissions, and auxiliary equipment, test runs on cottonseed and soybeans will be made to meet required specifications.

Detailed information on production, operation, equipment performance, and other features of this new solvent extraction process will be released at a later date by Lukens Steel Company and the Mississippi Cottonseed Products Company.

It is important to mention that the successful operation of the filtration-extraction plant depended upon the conditions of preparation used during rolling, cooking, and crisping of the cottonseed meats. Much progress already has been made at Greenwood in changing from preparation conditions for hydraulic pressing to those optimum for filtration-extraction. Preparation for hydraulic pressing yielded a cooked material having a mass velocity of 500 pounds per hour per square foot whereas optimum preparation for filtration-extraction yielded a material with 2500-3000 mass velocity.

The pictorial drawing presented (on screen) of the filtration-extraction installation at Planters Oil Mill of the Mississippi Cottonseed Products Company showed the equipment items and their relative arrangement with respect to each other. The principal equipment units were: extractor, slurry feeder, 10-foot diameter horizontal rotary vacuum filter enclosed in a vapor-tight hood, filtration receiver, work tank, desolventizer and condenser, vacuum pump, blow back compressor, evaporator and condenser, stripper and condenser, oil cooler, and refrigerated vent system.

A schematic drawing was shown (on screen) illustrating the essential operating features of the extractor (slurry mixer) and the 10-foot horizontal rotary vacuum filter.

This is a timely occasion to mention something about cooperation since it was of significant importance to us in developing filtration-extraction from the time laboratory work was started until a full scale industrial evaluation was realized. We initiated separate cooperative agreements with the Mississippi Cottonseed Products Company and with Lukens Steel Company. Both played an important cooperative part in fostering our pilot plant work on the filtration-extraction process for cottonseed and soybeans during 1952-1953. The mutual confidence and respect that existed between us and these two concerns contributed to the rapid progress that we made in securing the necessary information for the commercial adaptation of the process.

EXTENSION OF THE FILTRATION-EXTRACTION PROCESS TO VARIOUS OILSEEDS OF THE SOUTH

By
Edward A. Gastrock
Southern Regional Research Laboratory

As a result of our work on filtration-extraction with cottonseed and other oleaginous materials, we feel that three points are clear:-

1. Definite principles regarding particle size, diffusion rates, preparation, etc., apply to the filtration-extraction of all of these materials,
2. Success with any oleaginous material will depend upon how well these principles are applied, and
3. An understanding of the basic differences between the various oleaginous materials to be extracted and how to make adjustments for or take advantages of these differences is the most important consideration of all.

The filtration-extraction method has been extended to processing of the following oilseeds:

	Scale of Processing Work	
Oilseeds	Bench	Pilot Plant
Rice Bran	x	x
Soybeans	x	x
Cottonseed	x	x
Flaxseed	x	x
Peanuts	x	
Milo Germ	x	x
Sesame	x	

Proper preparation is the most important step. A properly prepared material must be easily extractible, easy to filter, and relatively incompressible, and must have a reasonable minimum fines content and proper size distribution. The ease of filtration of the material is measured by a term called mass velocity, which is the pounds of solvent per hour per square foot of filter area.

There are five steps in the accomplishment of proper preparation:

1. First determine the extent to which hulling may be necessary. Obviously, hulling would not be used for rice bran or milo germ. Also, as is the case with sesame and flaxseed, when hulls contain much oil, or cannot be removed without loss of oil, hulling is not done. Whenever possible, hulls should be removed, to make subsequent operations more efficient and uniform and to increase equipment capacity. In the case of cottonseed, peanuts and soybeans, some or all of the hulls may be added to the meats prior to extracting or after in order to lower or control the protein content of the final meal product.

2. The second step in preparation is conditioning prior to rolling. The main purpose is to help the rolling operation materials with refractory hulls or the hulls of which contain much oil, such as flaxseed and sesame require drying to about 2 percent. This makes the material more frangible, increases the capacity of the rolls and reduces power consumption. Fibrous materials such as milo germ also need drying. Rice bran needs only cooking and crisping before slurrying and filtration. Enzymes must be deactivated

with heat and moisture unless used immediately after milling. Other oilseeds, including cottonseed, peanuts, and soybeans follow a predictable pattern, as follows: Use a moisture content and temperature that is below the plastic range for flaking. This uses a little more power but promotes oil release (not actual oil flow). The optimum moisture content is somewhat proportional to the oil-free, moisture-free, content.

3. The third step in preparation is rolling. In this step, we make little ones out of big ones. 5-high, heavy duty rolls are satisfactory for most of the oilseeds we are discussing. Cottonseed is a special case, the pigment glands must be ruptured or weakened in addition to promoting oil release. Fortunately, the ranges for gland breakage and oil release overlap enough to do both jobs simultaneously. In rolling for filtration-extraction, fines need not be avoided. Cooking consolidates them. The goal is a balanced screen analysis to provide: (1) Oil release, (2) Rapid extraction and (3) Good drainage and washing on the filter.

4. Cooking is the fourth step in preparation. Cooking time is short (15-25 minutes) for very soluble proteins such as in soybeans and peanuts. Longer times (40-60 minutes) are needed for cottonseed and the fibrous materials. Rice bran requires 30-45 min. Temperatures need not exceed 225°F. Moisture for most materials must be between 12 percent and 20 percent, and for milo germ must be between 30 and 40 percent. Moisture is affected by oil content, protein content, protein solubility, starch content, and other characteristics of the material. The functions of cooking are (a) to complete the oil release started in conditioning and rolling, and if possible to put water on the inside and oil on the outside of the particles; and (b) to agglomerate and make big ones out of little ones. Where protein content and starch content cannot be depended on for agglomeration, a higher final moisture may be used. The final moisture must be about from 10 percent to 14 percent.

5. Crisping (evaporative cooling) is the fifth and last step of preparation. 1 percent to 3 percent of the moisture is lost during the conveying and screening operations. Screening may be required to take out water bolls and hull aggregates which may need some breaking up as by grinding or re-rolling. Crisping gives the cooked particles their relative incompressibility needed for filtration rates that result in high filter capacities. As a result, each particle appears to be separate from the others. A handful when pressed together, can be easily separated.

Extraction commences with the slurrying step. Its purpose is to put the oil into solution at the highest possible concentration. In concurrent flow, one of the filtrates from the filter is the extracting liquid. This filtrate contains initially about 10% oil and 90% hexane, and during the slurrying step the oil concentration may be increased to 30 percent or more. The time, temperature, agitation, consistency, miscella concentration, and perhaps other factors can be varied. The variables are mostly interrelated.

The filter performs the following functions:

1. It separates concentrated miscella from the solids in the slurry,
2. It refilters this concentrated miscella to reduce the fines content and to produce a final miscella,
3. It provides for an effective, multi-stage counter-current wash in which oil-free hexane is used as the final wash,
4. It reduces the solvent content of extracted and washed marc to very low values.

In addition, the filter is continuous and automatic in operation. The slurry feed may be flowed on to the filter and an even distribution is aided by the blowback. The blowback, using recycled, saturated vapors from the

filter hood, clears the screw of meal particles, once each revolution. A 60 x 60 mesh square weave has been found satisfactory. Five filtrates should be satisfactory for most oilseeds -- two for final miscella, to provide for refiltration, and three for the countercurrent washes. Calculations for filter sizes must be made for both solids and liquids to be handled, and for the mass velocity characteristics of the material.

In studying how solvent ratios affect filter operation, the following chart was made, which shows solvent ratios that result for various oleaginous materials with an assumed 30 percent oil in final miscella, 35 percent solvent in marc, and no loss.

Material	Oil % (approx.)	Meal %	Solvent Meats Ratio	Solvent Meal Ratio	Solvent per 100# of Meats In Miscella	In Marc
Rice Bran	15	85	.81	.95	35	46
Soybeans	19	81	.88	1.08	44	44
Cottonseed	32	68	1.12	1.64	75	37
Flax	40	60	1.25	2.08	93	32
Peanuts	45	55	1.35	2.45	105	30
Milo Germ	50	50	1.44	2.88	117	27
Sesame	55	45	1.52	3.38	128	24
Castor	65	35	1.71	4.88	152	19

The ratios are figures two ways, i.e., on the meats and on the marc. Note that the solvent-marc ratio increases much faster than the solvent-meats ratio, as the percentage of oil increases. Since a 1.64 to 1.0 solvent-marc ratio will satisfactorily extract and wash prepared cottonseed it should not require nearly 3 times that or 4.88 to 1.0 to extract and wash castor beans. Thus it should be possible to increase miscella concentrations without affecting extractibility for the higher-oil-content oilseed materials. We are trying to demonstrate this point, which will serve to increase filter capacity for the higher-oil-content materials.

In comparing filtration-extraction with respect to oil and meal desolventization, there are advantages here for other oilseeds as there are for cottonseed. It is likely that the 30% oil in miscella can be exceeded and 35 percent solvent in marc can be lowered. These advantages will apply to all oilseeds, and will result in savings in solvent evaporating costs and in increased capacity of equipment. Conventional oil and meal recovery equipment can be used in the filtration-extraction process.

With reference to oil and meal quality, the filtration-extraction process uses lower temperatures and shorter processing times than other processing methods. These two factors contribute much to product quality. They are under good control in the process and means are being sought to improve the control further.

In closing, this general statement can be made. In processing a variety of oilseed materials, the filtration-extraction process presents a wide choice of favorable combinations of operating conditions, thus making it possible to select processing conditions for various oilseeds that favor economic and efficient operation and high product quality.

Discussion

Allen Smith: In regard to rolled meats, how much water do you add to get flakes of 0.010 inch thickness?

Gastrock: You want the meats at a moisture content below the plastic

range. The amount of water varies with different oilseeds. With cottonseed about 8 to 10 percent can be used but that probably varies with different cottonseeds.

Allen Smith: We are adding water ahead of our rolls and you can add too much. They roll all right and the rolls can take the wet meats, but we can't get good extraction results with them.

Gastrock: Use of rolls for filtration-extraction is very much akin to the use in screw pressing. In both cases, work must be done on the meats to prepare them for oil extraction. The moisture should be added far enough ahead of the rolls to obtain the maximum degree of equilibration.

THE ECONOMIC VALUE OF LINTERS TO OIL MILLS AND FARMERS

By
John F. Moloney
National Cottonseed Products Association

I appreciate very much the invitation to be present today and to take part in your discussions. I am sure there are a number of individuals here who could handle the subject more adequately than I can. Actually, I attempted to convince Mr. Garner of that fact at the time he extended the invitation. As you can see, he was wholly unconvinced.

The subject assigned to me is "The Economic Value of Linters to Mills and to the Farmer." There is probably no quicker or surer way to start an argument than to discuss the economic value of some commodity, process, or industry. Most of us are inclined to place a relatively high value on the product, service, or industry with which we are associated and all of us, if pressed, will admit to some knowledge of economics.

One of the factors that contributes to controversy in this field is the fact that economic values do not lend themselves to the types of measurement that are available in many other lines of investigation. If you want to determine the volume of seed your mill is handling daily and the yields of products, you can do so and obtain results that are not subject to debate. The more complicated task of determining the quantity and quality of the constituents of cottonseed can be accomplished by the chemist with reasonable exactitude. But if we set out to prove that agriculture is more important to national prosperity than industry or that cotton is as important to national defense as steel, we can collect great masses of data on the subject but we can really prove nothing and our conclusions are open to endless argument. The subject of the economic value of linters must be approached with these limitations in mind.

Most historical reports on linters carry a statement to the effect that, prior to World War I, linters had little or no economic value. I wish to suggest that this is not strictly accurate. From the very beginnings of the cottonseed processing industry in this country, linters have been a major factor in mill operation. To illustrate, between 1825 and 1850, a number of mills were established to crush cottonseed. Every one of those mills failed and the reason for their failure was that there had been developed no effective means of separating linters - and hulls - from the cottonseed kernels. Until such means were developed, cottonseed processing was not economically practicable. During that early period, linters may certainly be said to have had a negative value. Even after the development of delinting, hulling and separating equipment, it was many years before markets were developed to the

point where linters acquired positive value to the mills and to the producers of cottonseed. The point is that linters have always been a basic factor in the efficient processing of seed and that, under any foreseeable conditions, they carry some value, whether it be positive, negative, or zero.

Turning now to methods of measurement, if we know the yields and the market prices obtainable for the various qualities of linters, it is a matter of arithmetic to calculate the income per ton of seed that can be realized by a mill. Naturally, that income varies from time to time and from mill to mill. Historically, the U. S Department of Agriculture reports average annual value of linters per ton of seed varying all the way from $1.24 in the 1932 crop year to $29.99 for the 1950 crop. Over a recent ten-year period (1942-51 crop years), according to the same source, the value of linters averaged $12.33 per ton. This was equivalent to 13 percent of mill income from all products and was several times the net profit which mills realized per ton of seed processed.

Any allocation of the value of one of several joint products to the raw material from which such products are obtained must be arbitrary. One acceptable method of making such an allocation, however, is to assume that each product accounts for the same percentage of raw material value that it does of finished product value. In other words, if linters accounted for 13 percent of the value of oil mill products, it can be assumed that they accounted for 13 percent of the value of cottonseed. On this basis, it can be stated that linters returned to the farmer an average of $8.13 for each ton of seed which he sold during the ten-year period referred to above. On a 12,000,000 bale crop, this is equivalent to approximately $35,000,000 in farm income. While this sum does not rank with the billions of dollars that are so casually discussed these days, it is sufficiently large to show that we are dealing with a factor of economic significance.

Members of the cottonseed processing industry are well aware that the cotton producer attaches greater importance to the cottonseed dollar than to the dollar he receives from cotton lint. This is one of those psychological factors which, whether explainable or not, limit the conclusions that can be drawn from economic or statistical analysis. One explanation lies in the fact that income from cottonseed is commonly the first cash money that the producer receives for his season's work. A second explanation may be found in the fact that a change of $12.50 per ton in the price of cottonseed seems like a large amount, while a change of 1 cent per lb. in the price of cotton lint appears nominal. The two changes are equal insofar as their effects upon farm income are concerned. In any event, the farm value of $8.13 per ton of cottonseed which we can impute to linters on the basis of the Department's figures (described above), is a sum that producers consider highly important.

As already indicate, linters assume an importance in mill operation that is out of proportion to the income they produce. While the percentage will vary with the mill and with the type of process, it is estimated that the removal of linters accounts for about 60 percent of the power cost, 25 percent of the labor cost and from 20-25 percent of the total cost of mill operation. In other words, the cost of producing linters - that is a reasonable allocation of raw material cost, plus the cost of processing - exceeds mill income from that particular commodity.

This situation has suggested to some that, rather than seeking to improve the quality of linters and the efficiency with which they are produced, mills might attempt to eliminate delinting entirely or at least reduce production per ton to a substantial degree. Such an approach, however, overlooks certain

basic considerations. Cottonseed, as received by the oil mills, carry an average of about 12 percent linters. A minimum quantity of this fiber - the amount will vary with the character of the cottonseed - must be removed to permit maximum oil recovery, a desirable quality of meal, and effective mill operation. This minimum quantity could be significantly less than current yields and its removal could be accomplished at some reduction in current delinting costs. However, since each additional pound of fiber left on the seed would have to be sold as hulls, the price of such fiber, with due allowance for its cost of removal, would have to approach the price of hulls before such a reduction would be economically practicable. This suggests that present mill practices with respect to delinting are likely to continue for the foreseeable future.

The reasons for industry concern over linters have been thoroughly discussed at previous processing clinics and in a number of articles in the trade press. They will be further discussed later in this meeting. To summarize, linters are encountering increasing competition in both first and second cut markets. The quality advantages historically held by linters are being steadily narrowed and their income-producing value, to both oil mills and cotton producers, is being reduced. Under these circumstances, the industry is seeking through research to find ways and means to produce and market a better product.

The cottonseed industry is extremely fortunate that such an excellent cottonseed research program is in operation here at the Southern Regional Research Laboratory. On a number of occasions, members of the Laboratory staff have stated that in no other commodity does there exist a comparable program involving such extensive and intensive cooperation among Federal agencies, the State Experiment Stations, and private industry. Historically and at the present time, the greater part of this program involves cottonseed oil and cottonseed meal, the two most valuable products of the seed. Members of the industry are encouraged to note, however, the recent interest of the Laboratory in the problems surrounding the production of quality linters. Just as the removal of linters constitutes an integral part of efficient oil mill operation, so also, it is felt, they should be an integral part of cottonseed processing research. While the efforts so far devoted to linters have been of a preliminary and exploratory nature, it is hoped that they will point the way toward making investigations in this field a significant part of the total research program.

REPORT ON SURVEY OF PROBLEM OF CLEANING COTTONSEED AND LINTERS AND PRELIMINARY EXPERIMENTAL RESULTS

By
Leo L. Holzenthal
Southern Regional Research Laboratory

The problem of cleaning cottonseed and linters has received considerable attention during the past two clinic meetings.

As a result of conferences between officials of the Valley Oilseed Processors' Association and officials and Section Heads of the Southern Regional Research Laboratory a survey was initiated in early 1953 to determine the extent and seriousness of the problem and the possibilities for technical solution.

Following visits to eight oil mills, three gins, one linters pulp plant, and three equipment manufacturers in the Delta and West Texas Regions, a

preliminary working report was prepared and submitted at the Second Valley Oilseed Processors Clinic, March 8-10, 1953. This report was also submitted later at the Fifth Annual Convention of the Cooperative Oil Mills Association at the Laboratory on March 16-17, 1953. In addition to information obtained from meetings and visits mentioned above, considerable first hand information was obtained during the course of the 21st Annual Short Course for oil mill operators sponsored by the Texas Cottonseed Crushers Association and the A. & M. College of Texas in cooperation with the National Oil Mill Superintendents' Association, May 25-28, 1953. A brief résumé of events leading to the initiation of a survey by the Southern Regional Research Laboratory on the cleaning of cottonseed and linters, as well as a progress report on exploratory work on two devices for cleaning cottonseed, was presented at this short course meeting.

Although work on this problem started with the survey in January 1953, as reported above, efforts have mainly centered on the accumulation and evaluation of data for a more complete survey report. Some exploratory tests have been carried out on the traveling belt, and one device for removal of sticks has been under consideration.

The survey report has been compiled and is now in process of review. Because of the wide divergence and quantity of material collected and the time required for editing the report, we could not have it ready for distribution at this clinic meeting. However, it should be ready for distribution within the next few months.

We are now presenting a preliminary report on our findings or conclusions and recommendations. A more complete list of conclusions and recommendations will be included in the final survey report.

The survey reveals the following:

(1) The Delta and West Texas Regions of the cotton belt are now undergoing changes in harvesting methods which, in most cases and during an appreciable part of the season, cause significant increases in foreign matter content of seed cotton.

(2) Since the cotton gins are obliged to satisfy the farmer demands for highest possible return for his lint cotton (value about four times that of cottonseed) they are frequently limited in the extent of cleaning that could be done by the necessity of producing lint cotton of optimum quantity and quality. Thus a high degree of trash removal from the seed cotton from the ginners point of view might not be generally desirable. Thus a variable quantity of trash can be expected in cottonseed delivered to oil mills.

(3) Very encouraging results are being obtained by the U. S. Cotton Ginning Laboratory in their efforts to further reduce the foreign matter content of seed cotton before it enters the gin stand, and the reduction of foreign matter content in cottonseed resulting from their efforts is very helpful, but it is not likely that complete removal of all types of linter degrading foreign matter will be effected at the gins.

(4) Removal of foreign matter from cottonseed as it is received at the oil mills and before storage would be of great benefit to the seed crushing industry and to users of cotton linters. All groups working on the problem should keep this fact in mind when considering possible use of new principles for seed cleaning.

(5) Until seed can be cleaned as received at the mill, work must continue to improve existing seed cleaning devices or provide new devices to clean seed in the course of normal mill operation.

(6) From an overall point of view, existing seed cleaning equipment in oil mills in most of the belt is incapable of reducing the foreign matter content of cottonseed, during the latter half of the season, far enough to insure a feed to the delintering machines low enough in trash content that will not seriously affect the quality of the linters produced.

The reports on linters and cottonseed quality indicate that, in general, for years 1946-1950: (a) the proportion of chemical grades of linters to all grades varied between 55 and 72 percent; (b) the proportion of "off-grades" of chemical linters in the total of all grades (including off-grades) varied between 13 and 21 percent; (c) the proportion of chemical "off-grades" to total chemical grades (including off-grades) varied between 13 and 31 percent; (d) the proportion of chemical "off-grades" to the total "off-grades" (of all grades) varied between 55 and 72 percent.

The proportion of cottonseed that might be considered as causing difficulties in maintaining grade in linters is estimated at <u>one-third</u> of the total production.

(7) The trend in harvesting is unmistakably towards rougher methods. Approximately 63 percent of the 1952-53 crop was harvested by hand picking as compared with 71 percent for the 1950-51 crop. There has been an increase in mechanical harvesting from 8 percent of the 1950-51 crop compared with 17-20 percent for the 1951-52 crop. Sufficient mechanical harvesters were available in 1952 to harvest 5,000,000 bales. The number of spindle pickers was also estimated at approximately 12,000 units in 1952 as compared to about 7,300 in 1951. Strippers increased during the same period from 15,000 to 20,000 units.

It is interesting to note that 85 percent of the California crop for 1952-53 was harvested by mechanical pickers, whereas 15 percent of the Delta region was so harvested.

(8) The major oil mill associations have been focussing their attention on this problem since 1952. Their committees have made progress in attempting to hold present linter quality, but no definite solution to the overall problem is yet in sight.

(9) Manufacturers of seed and linters cleaning equipment are making contributions, both direct and cooperatively, to improve existing equipment to relieve the present burden on the oil mills. Not many long range research and development efforts are being aimed at entirely new methods of cleaning cottonseed or linters.

(10) It is the concensus of opinion that existing linters cleaning equipment is generally satisfactory and will be capable of doing an even better job when improved or new seed cleaners are provided. The emphasis should now be placed on devices for seed cleaning.

(11) Significant statement of the present situation relative to oil mill equipment was made by one of the industry's leaders as follows: "The whole thing boils down, so to speak, to this. <u>It could be stated bluntly that our system of seed cleaning equipment desperately needs drastic changes in design or a new approach to the problem of cleaning cottonseed.</u> <u>To me, this is forcibly brought to light when you find 50-55 percent total foreign matter removed is, in most mills, considered the best we can do today in cleaning trashy cottonseed.</u>"

(12) The present competitive position of cotton linters is summarized by the following statement from a leader in the industry. <u>"If we do not make drastic improvements in the quality of chemical linters, they will be entirely supplemented by wood pulp within the next few years.</u> <u>To many of us this threat of wood pulp was an old story and in past years it may have been just that, but we are now convinced it is no idle threat.</u> <u>Wood pulp processing has improved</u>

to such an extent that many consumers of pulp now prefer it to linters and to such an extent that it must contain less trash than the finest quality chemical lint we have ever produced."

(13) Increase in use of wood pulp in lieu of cotton linters pulp in production of chemical cellulose is due principally to the following reasons: (a) Supply is limited mainly by size of cotton crop. Supply of wood pulp is not so limited and can be expanded as demands are made. (b) Price structure is not stabilized to the point where it could be competitive with wood pulp. Fluctuations in price, as compared to those of wood pulp cause concern and hesitancy on the part of users making end products that are in a highly competitive field. (c) Quality of linters is not consistently high from several standpoints, chief among these is the amount of certain types of undesirable foreign matter. At times, this is so objectionably high that it causes difficulties in certain major chemical uses of second-cut linters.

Quality of wood pulp is improving at a tremendous pace, and the quantity will soon be increased, with new plants now being completed, to more than supply foreseeable needs of the industry. Considerable research effort is now being expended by the wood pulp chemical cellulose interests in finding new and improved uses for their product. New uses for chemical cellulose will probably continue to make their appearance on the market. In fact, an entire new field of chemistry has been unfolded - this field of chemistry is known as Silvichemicals or chemicals from wood.

Due to the fact that wood pulp can now be used in the preparation of cellulose having alpha-cellulose content very close to that of the highest grade chemical cellulose made from linters, wood pulp will very likely absorb any new product that is produced using cotton linters as a raw material. For the present, it is suggested that new uses for linters should therefore be based principally on their physical properties or modified chemical and physical properties in order that wood pulp may not absorb them.

(14) The extent and seriousness of the problem justified preparation of this survey report. The authors as well as officials of the Southern Regional Research Laboratory have recommended a survey report and exploratory work be undertaken on seed and linters cleaning and the results be furnished the industry.

<u>Preliminary Report of Recommendations</u>: (A) That oil mills now consider the problem of cleaning linters as primarily one of cleaning cottonseed.

(B) That the problem of cleaning cottonseed be considered an oil mill problem. It is not intended that assumption of this responsibility by oil mills should cause relaxed efforts on the part of ginners to improve seed cleaning. Ginners are guided mainly by the cleaning operations on lint cotton. This might or might not preclude removal of all trash from cottonseed.

Further, from an overall point of view, it would be more economical to provide seed cleaners at oil mills instead of at gins for the following reasons: (1) The greater number of gins compared to the number of oil mills. Approximately 7,500 gins to 235 oil mills. (2) Gins operate for shorter periods than oil mills. Approximately 10 weeks as compared to 6-10 months. (3) Generally, the foreign matter content of seed usually increases as the season progresses and the feasibility of installing a seed cleaner at any one gin would have to be determined more or less individually and would involve a study of present harvesting methods as well as possible future trends. Thus, in any one locality, some gins might be in a position to turn out seed with less foreign matter than others in the same general locality. Since oil mills in some cases receive their seed from many scattered gins it is possible then

that one oil mill might receive several shipments of high foreign matter content seed which when conveyed to storage would raise the overall foreign matter content of an entire storage bin or tank of seed.

(C) Cleaning cottonseed as received at oil mills and prior to storage would benefit the industry. A few of the advantages follow:

1. Decreased hazards of storage. Accumulation of excess amounts of foreign material in seed has been reported in some instances to be the cause of overheating.

2. Increase the efficiency of crushing. This is usually accomplished through increased seed throughput, decrease in loss of linters during cleaning, less oil absorbed by foreign materials.

3. In some instances, increase in quality of product from cottonseed. Foreign matter content, if low, will contribute both directly and indirectly to grade increase in linters. In addition, reduced rate of increase in free fatty acid content during storage will minimize oil loss.

All groups interested in providing seed cleaning equipment for oil mills should appraise proposed new cleaning methods with this thought in mind.

(D) Every effort should be made to find new markets for linters. Emphasis should be placed on uses that cannot be absorbed by wood pulp, i.e., uses that will take advantage of existing or modified physical or chemical properties. Aside from the possible new uses based purely on existing physical properties, new uses based on existing chemical properties might include products obtained from second-cut linters at the various stages in its chemical processing up to a point just short of the dissolving step. Linters modified chemically only to the point of enhancing certain properties without destroying their original shape could include: Flameproofing; increasing water resistance, stiffness, elongation, water solubility; and resistance to rot and heat. Other new uses might include either partial or complete coating with synthetic rubber or other material in order that moulded resiliant shapes could be produced that might compete with foam rubber, etc; use for moulded products wherein additions and coating materials could include cottonseed protein glues, plastics, etc.

Every effort should be made to determine properties desired in linters for existing and new uses in order that work can be directed along these lines.

(E) Another survey should be made in connection with the use of linters for high grade paper. Competent authorities on this subject and in related fields should be consulted and recommendations submitted to the cottonseed crushing industry.

(F) Long range plans should be made now with the objective to provide seed cleaning devices for oil mills that will insure virtually clean seed to first-cut linter machines even with straight run seed ginned from late season stripped or sledded seed cottons. This will provide a margin or factor of safety in seed cleaning that is practically non-existent in the industry today. Further, linter machines will go back to the job they were originally intended to do, and they will, in turn, no longer be considered as cleaners, nor will they create the added cleaning job linter beaters are now doing. The latter, relieved of the burden of removing both the naturally occurring and linter-manufactured trash should do not only a much better job of cleaning linters, but do so with much reduced loss in linter quality and quantity.

(G) The industry should continue their cooperative efforts to solve the problem through oil mill associations, universities, Governmental agencies, and manufacturers of oil mill equipment. Now that interest has been aroused in this problem and many groups are at work, results should be obtained soon.

(H) Upon completion of the present survey report, the Southern Regional Research Laboratory should continue to keep abreast of not only the seed and linters cleaning problem, but also the overall linters situation. In this manner the rate of progress in the solution of the problem as well as significant trends in the overall situation and their effects on the industry will be known. In addition, every effort will be made to expand our exploratory work to try some of the new approaches to a solution of the problem that have been submitted.

Progress Report on Preliminary Experimental Results Obtained in Cleaning Cottonseed. Preliminary Results of Exploratory Work on the Traveling Belt. The traveling belt experiments are now in progress and results obtained thus far are too few to furnish a basis for evaluation of the idea. The following remarks are therefore made only with a view of providing some knowledge of the general trend the work is following.

Using a 3-foot wide, 10-foot long canvas belt operating in a horizontal position with 5 scoops located immediately above it to catch the seed that bounce, and two fractions of seed that are conveyed off the belt, the following was noted.

(a) Seed collected in the scoops contained less foreign matter than seed conveyed off the belt.

(b) Most of the sand, fine field trash, lint and grabbots were thrown immediately forward of the conveyor.

(c) Clean sound seed with minimum lint was thrown the greatest distance from the conveyor.

(d) Seed, usually with some lint attached, sticks, burrs, and other trash fell between fractions described in (b) and (c).

With speeds at 2650, 3970, 4800, and 6880 feet per minute for any one series of runs and conveying over initially 100 pounds of seed, previously freed of grabbots and large field trash, the clean fractions, i.e., those in the scoops and that at the greatest distance from the conveyor were recycled until little or no reduction in total trash was observed. The final minimum trash content after 3-4 recyclings was about 0.5 percent in sample of about 20 pounds, and this seed contained sticks of small diameter and length approximating that of the seed. No appreciable reduction of trash content of this fraction could be achieved in any of the speeds tried. Likewise, the remaining two trashy seed fractions were recycled until no further increase in trash content was noted. In practically every instance a condition was reached after 2-3 recyclings wherein the partially ginned seed and sticks and other trash resulted in a matted condition such that the entire mass could be raised with the thumb and forefinger alone. This usually occurred at a total trash content of about 10 percent and the sample usually reduced to a total weight of about two pounds. Further recycling though carried out by separating the mass by hand raised the trash content to as high as about 29 percent but many partially ginned seed were in the mass.

Thus, as present trends indicate, devices may be necessary to remove the seed or trash from the final products mentioned above before one fraction containing pure seed and another containing all trash can be obtained. Possible use of air separation to remove the 0.5 percent of fine trash may be suitable for the clean fraction and further ginning and stick and burr removal may clean up the final "trashy seed" fraction. Our string device for removal of sticks may prove suitable for use in this separation.

It must be recognized that these results are based on one position of the belt and one type of belt. Drastic differences in results may be obtained using a belt of slightly different texture or by changing the angular position of the belt. Only trial of these variables will tell the story.

VALLEY OILSEED PROCESSORS' ASSOCIATION

PRESENTATIONS ON INDUSTRIAL PROCESSING PROBLEMS

IN MEMORY OF T. P. WALLACE

By
Ralph Woodruff, Chairman
February 16 Session

At the conclusion of Mr. Ralph Woodruff's opening remarks, a tribute was rendered to the memory of Mr. T. P. Wallace as follows:-

Since we last met, we have lost one of the pioneers in this movement. He was advisor to any confidant of all of us in the oil mill business in our generation. I shall ask you to stand in a moment of silent tribute to the memory of our departed friend - T. P. Wallace ------

Thank you.

REPORT BY THE SUB-COMMITTEES ON LINT CLEANING AND COTTONSEED CLEANING

By
J. H. Brawner, Chairman, Sub-Committee on Cottonseed Cleaning, VOPA
Southern Cotton Oil Company

Mr. Wells and I were appointed the chairmen of the lint cleaning and seed cleaning committees at the end of our clinic last year. Unfortunately, it was impossible for Mr. Wells to be here today, so I will do my best to pinch-hit for him.

When we started out to prepare a program for this year's work, we reviewed what had been done last year and tried to arrive at some conclusion as to what our problems were. The first conclusion we reached was that we could not separate and distinguish discussions of seed cleaning and lint cleaning. The two problems were so completely involved with each other that Mr. Wells and I decided that the best thing we could do would be to have a joint program with both of us working together in planning the program.

In thinking about the work that was reported last year and in thinking about the problems with which we were personally familiar, we reached the following conclusions. We felt that there was some confusion in the marketing of linters. The oil mills were not too familiar with what the special requirements were for various uses of first and second cut linters. We thought, therefore, that it would be a very good idea to have some men who use linters or who are familiar with the consumption of linters to tell us as nearly as possible what types of materials various linter consumers would like to have.

As soon as you start talking about producing linters that consumers can best use, you run right into another problem. This is the problem of knowing when we are producing the desired material. We are going to discuss this problem a little bit today, but it is, of course, obvious that we could not cover the entire field of standards and analytical procedures at this session.

The second problem that apparently has been facing us is the problem of producing linters of the desired cleanliness for almost any of the consumers. On the basis of the information that was presented last year, it seemed to us that two problems existed. The first of these is the problem of doing the very best possible job with the available standard equipment on the market. Allen Smith, in his very fine paper last year, demonstrated quite clearly that we actually were manufacturing some of the trash that is causing us

trouble. After living in west Texas for several years and then moving back into this part of the country, I was convinced that this factor was the most important in a large part of the Mississippi Valley and in the Southeast. I have personally explored the possibility in this direction this past year with some very gratifying results. I do not want to minimize the importance of developments in seed cleaning and lint cleaning, however. Those mills in west Texas and those mills in west Texas and those mills that draw seed from the northeast Arkansas and Southeast Missouri areas very definitely get a type of seed that the ordinary amount of ordinary equipment will not handle satisfactorily. I am sure that as mechanical harvesting spreads, the problems that the west Texas operators have are going to be extended to other areas of the cotton belt, so those of us who now are fortunate enough not to be bothered with a large excess of field trash in our cottonseed need not feel to complacent. Perhaps we are going to be having some of these problems sooner than we think.

In the development of seed cleaning machinery, most oil mill operators are at a great disadvantage. They are working under severe pressure. They get into trouble and then they begin to do everything that they can think to do and to try any device that might have some value. When they do get improvement in their lint quality, they stop trying as soon as the lint is acceptable to the buyer, and they do not know what they did to produce the improvement because they were doing everything humanly possible to get out of trouble. In order for us to nearly find out what basic principles should be followed in the design of satisfactory machinery for seed cleaning or lint cleaning, we need to do a very careful type of research work which most of us as operators are not equipped to do. Therefore, I personally was greatly pleased last year when the Southern Regional Research Laboratory began working on seed cleaning. I am sure that if this work is permitted to continue, we will finally know exactly what types of basic operations are necessary to separate foreign matter from cottonseed. It, then, will be up to the operators to test those processes and up to the machinery manufacturers to produce the machines that satisfactorily incorporate the fundamental principles in a practical device. I hope very much that this work can go on, as I feel it is the only way we really will make any future progress in cleaning.

A little while ago you remember that I mentioned that we were asking some people familiar with the consumers' needs in terms of lint quality to tell you about these needs. We are going to start our discussions of this phase of our clinic by asking Mr. Marion Mann to talk to you about the desirable characteristics in linters on various markets.

DESIRABLE CHARACTERISTICS OF LINTERS FOR VARIOUS PURPOSES

By
Marion E. Mann
Williamson, Northrup Company, Inc.

There are, of course, various opinions of the most desirable characteristics of linters, even among manufacturers of the same or similar products. This depends to some degree on whether or not the linters are being used in a blend with other fibers, the type and condition of the manufacturer's machinery and, somewhat, on the competition in each field.

In gathering information on this subject I have consulted several manufacturers, both large and small, and consolidated the majority opinions

together with what we think we have learned through several years of experience in the capacity of suppliers of linters.

Principal Uses of Linters: The largest volume of linters is used in the chemical industry for the manufacture of acetate, rayon, plastics, explosives, films, paper etc., amounting to about 60% of the 1951-52 crop.

The main non-chemical uses are for bedding, automobile batts and pads, furniture upholstery, etc. Relatively smaller quantities of linters are used in the manufacture of battery boxes, pharmaceutical supplies, linoleum, etc.

Chemical Uses: The chemical industry, being the largest consumer of linters, has been more publicized than others, and the desirable characteristics of linters for this purpose are no doubt well known to all of you.

Generally speaking, the domestic bleachers desire a clean, uniform quality second cut, as free as possible from heavy shale and other foreign matter which will not dissolve easily in the chemical process. If trash particles remain in the pulp after the usual cleaning and filtering process, they will clog the tiny holes in the rayon spinnerettes and also cause defects in such finished products as films, plastics, etc.

Small pepper trash is contained to some degree in all second cuts and, while usually this will dissolve in the chemical process, it results in loss to both the oil mill and bleacher in lower cellulose content and, therefore, should be kept at a minimum.

Chemical Raw Lint for Export: The same characteristics mentioned above are desirable for the foreign manufacturers - but to a greater degree as far as cleanliness is concerned. They advise us that they do not have the modern machinery necessary to use advantageously the low grade second cuts, but must have lint which is very clean, free from shale, and which will run considerably higher in cellulose than is usually required by the domestic chemical industry.

First Cuts for Export: The export of first cuts has been almost negligible recently due to competitive foreign substitutes, foreign exchange, and scarcity of good stapled linters. Usually the foreign trade desires a good stapled, clean first cut which would grade Government #2 or better.

Hospital and Medical Supplies: This is usually referred to as the "Pharmaceutical Trade," manufacturing such products as absorbent cotton, surgical sponges, hospital bed pads, sterile compresses, sanitary napkins, etc.

The desirable characteristics of linters for these purposes are good staple, cleanliness and smoothness. Most of the linters used in these products are bleached and, in a majority of cases, are blended with other fibers.

Harshness is another desirable quality for the manufacture of bed pads and some of the surgical supplies. Harshness, of course, is controlled by climatic conditions in the growing area and there is not much the oil mills can do about this feature.

Good color, which makes for an easier bleach, is also desirable but relatively unimportant if the linters contain the other desired virtues.

Linters with the necessary staple and smoothness are very scarce and are usually produced in the early season -- generally in the Southeast. After these small quantities are gone, the manufacturers have to turn to linters of foreign origin, as well as to clean waste which meets their requirements.

Due to lack of the proper quality, relatively few domestic first cuts are being used by this trade. Improved quality of first cuts would no doubt result in a much larger consumption of linters in this field.

Mattress Manufacturers: While some of the mattress manufacturers making "name brands" have pretty rigid specifications as to staple, color and harshness - about a Government #2 -- most of the others making an average

mattress felt use #3 Middle to #2 Low, with harshness and average cleanliness the desirable virtues. Color, while desirable, is not a prime requisite.

The linters are usually blended with re-worked strips, pickers or other grades of waste with some staple, although practically no two mattress manufacturers use the same percentage of first cuts in their blends. Some few use linters only to make felt in which case staple is absolutely necessary.

As a rule, the mattress manufacturers make felt for their own use: therefore, they try to make a good, resilient grade of felt but are not subjected to the competition which the commercial felt manufacturer encounters regarding color and cleanliness (in the better grades).

I believe that, on the whole, the mattress industry would use a great deal more first cut linters in their products if the staple were improved sufficiently to allow them to use first cuts which would run through the garnetts without excessive loss. At the moment, they are using strips, picker, etc., to help carry the linters through the machines.

For blown mattresses, harsh second cuts and low millruns of average cleanliness are desirable.

<u>Commercial Felt and Batt Manufacturers:</u>

<u>Automotive Batts:</u>

The felt used by this industry will range in grade from a very high-grade for the expensive cars to a very low-grade for the more economical ones: therefore, it is necessary to make many blends and qualities.

Some of the manufacturers list the desirable characteristics as:

1. Color
2. Body, or Harshness
3. Staple

in that order. Color is very important in making the sale of these batts, and it is seemingly considered a measure of grade -- the whiter the batt, the easier to sell.

The body of the lint is very important in making a high-grade batt as this gives much better filling qualities for the finished felt pad and prevents breakdown of the cushions, pads, etc.

Some of these manufacturers say that staple is the least important of the above factors as, generally speaking, they can get staple from waste products at a cheaper price than long stapled lint: and until good stapled linters are produced at reasonable prices, they only require enough fibre for smooth carding and a minimum loss in shrinkage. If the staple of first cuts were improved they would be used more in place of waste - provided prices were competitive.

The automotive trade uses low-grade first cuts, millruns and second cuts in some of their cheaper batts, and harshness and economical prices are the desired characteristics on these batts.

<u>Furniture Trade:</u> Here again, we have numerous grades of felt for various prices of furniture. However, the competition with other substitutes is such that it is almost imperative that these manufacturers make the best possible felt at cheapest possible prices, consistent with the quality specifications.

Some of our manufacturing friends who make excellent furniture state that linters suitable for the manufacture of good furniture should be harsh in character, reasonably clean and free from foreign matter, with uniform staple of the greatest length obtainable from the seed now available to the crushers. While there are probably different opinions some of the manufacturers of better grades believe the best furniture felt is made from all Linters mixed with a very small amount of rough India Cotton. This would require the quality of

the linters to be such that they will carry through the machines and give sufficient strength to the finished products without the use of long stapled waste materials such as strips, high-grade pickers, etc.

One manufacturer says that, due to the deterioration in first cut linters during the past five years, he has had to put 30 percent waste in one of his batts; whereas, he used to use linters entirely mixed with a small percentage of India Cotton. Unless something is done about improving these grades of linters, it is possible we will continue to lose volume in this field.

Batts for lower-priced furniture still contain a certain amount of average-grade first cuts and millruns, but practically all manufacturers desire as much harshness as possible.

Battery Boxes: Approximately 20,000 bales were used in this industry during the 1951-52 season. Second cuts of average cleanliness with enough fiber to serve as a binder are desirable and necessary for this purpose. The linters are blended with asphalt or similar materials and molded into the desired forms; therefore, the linters require very little processing and are generally preferred over kraft paper or similar competing materials --- presuming linter prices remain competitive.

Linoleum: Linters used for this purpose should be reasonably clean and produced only from prime seed. The requirements are approximately the same as for battery boxes; therefore, excessively trashy lint is not acceptable.

Discussion

Brawner: Is the quality known as harshness dependent on seed variety and has it deteriorated as a result of changes in varieties of seed?

Mann: Yes, it is a property of seed variety, locale and growing conditions.

Verdery: What does Mr. Mann think of the future of chemical linters, that is, the possible price situation in view of government-held reserves?

Mann: I can see little prospect of any price advance.

Verdery: That is a pretty safe assumption, but how about a price drop?

Mann: I can't say about a drop, I certainly can't see any rise. It all depends on the demand and the amount of speculation.

DESIRABLE CHARACTERISTICS OF LINTERS FOR PAPER MANUFACTURE

By
B. B. Annis
Ward-Voss and Associates

As raw material for the cotton content of fine writing paper, the following can be listed in order of desirability: white all-cotton rags, colored new and used rags and cuttings, paper mill wastes, raw cotton, first cut linters, millruns and second cuts. All of these except millruns and second cuts consist of fibers of approximately equal length and strength.

After preliminary cooking, bleaching, etc., these fibers suspended in water are cut and beaten between rotating knives so that they end up of the proper length and so purposely bruised that the cellulose is partially hydrated, so that when the sheet is formed, these fibers interlock to form the finished paper.

With fibers all about the same length to start, and with each receiving the same treatment, the final stock will consist of fibers of approximately

equal length. Millruns and second cuts consisting of widely varying fiber lengths, when treated to cut the longer fibers down to a proper length, must of necessity have the shorter fibers cut to a point where a large proportion of the resulting stock can be regarded simply as a filling material not adding much strength to the finished sheet.

An added undesirable characteristic of millruns and second cuts is that they resist hydration in the beater so that the finished paper tends to be "free" or blotter-like.

For the past year, Ward-Voss & Associates, in conjunction with the Lubbock Mill of Anderson, Clayton and three or four paper mills, have been working together to develop a new type of linter which should overcome most of these objections.

Several carloads have been made up as follows: four separate cuts are made, all the fines from the first cut and second cut are cycled around the third cut, being added to the seed at the fourth cut. The third cut of about 25 pounds thus ends up as a short fibered linter of very uniform length of staple with practically no fines or hull pepper.

Preliminary tests show the tear test of paper made from this special linter average 122 as compared with 86 for an average second cut. The fold test averaged 84 as compared to 40 for a standard second cut. These results are encouraging.

We are placing two additional cars at a large paper mill next month hoping that they will alter their beating procedure so that there will be very little cutting but increased hydration and bruising which should show further increase in quality.

Statistics show 57,800 bales of linters used in the manufacture of writing paper in 1952, if the entire cotton content that same year had all come from cotton linters, the consumption would have been 278,793. The only thing stopping it is the quality of the paper. We think we are on the right track to increase this quality.

Discussion

Brawner: Are the paper manufacturers turning more to linters because the rags which they can obtain today contain synthetic fabrics which "poison" them for paper-making?

Annis: Yes, that is one factor which may help linters consumption. A variety of materials are available but they like to work with material which requires a minimum of operational changes consistent with uniformity of product. However, a maximum of only 20 percent of linters can be used by most manufacturers; only one manufacturer uses as much as 60 percent.

Brawner: In regard to the hydration problem, would the physical characteristics of the linters affect their use in paper making, and would solution of the hydration problem improve the situation?

Annis: Yes, hydration by the usual means in beaters breaks the lint down into too-short lengths. The new linters which we propose, need not be cut during beating, only rubbed to effect hydration. The paper manufacturers have research laboratories but they are difficult to work with, as each manufacturer likes to keep his processes secret, and use any advances for his own advantage. I think that work on this problem by the Southern Regional Research Laboratory in cooperation with this group (V.O.P.A.) and the paper research laboratories would be very useful.

Garner: Do paper manufacturers have any preference as to the origin of the lint, that is, what area it comes from?

Annis: Yes, on the part of individual mills. Some have a preference for lint from certain areas, others for lint from other areas, and all are convinced that their preference is best. I do not think that there is actually any real difference in the lint from different areas, it is just a matter of preference.

Mr. Brawner invited Mr. Verdery to make some remarks on the special type lint which his organization (Anderson-Clayton Company) had been producing for Mr. Annis at Lubbock.

Verdery: We have put considerable effort and some money in producing this lint for Mr. Annis' organization in an effort to find new markets for lint.

Holzenthal: With reference to Mr. Annis' statement about leaving some lint on the hulls - would leaving this lint on hurt the sale of the hulls for feeding purposes?

Unknown: No, it would help.

Verdery: Lint on the hulls does not hurt their sale for feed. However, leaving say 20 pounds of lint on hulls costs money as there is no extra labor cost involved in cutting this lint and the only actual cost is the very small amount of power required. This last cut is the cheapest lint to produce.

Roberts: Do you have any seperation problem in cutting this lint?

Verdery: There are some problems of course but they don't amount to much.

Roberts: Do you have any trouble with fine meats in this fourth cut?

Verdery: Yes, some, but it is a problem which can be solved by adjusting the saws.

Brawner: Back years ago when lint was left on hulls, farmers liked woolly hulls. Then we started making a closer cut and they became accustomed to less lint on hulls and liked that; now, when we are leaving more lint on they complain about the amount of lint. It is just a matter of what they are accustomed to.

THE VALUE OF A PHYSICO-CHEMICAL METHOD IN THE DETERMINATION OF SECOND CUT LINTERS QUALITY

By
J. W. Bremer, Jr.
Swift and Company

History: At a special meeting of the Lint & Seed Cleaning Committees in September last year, work which you will hear or have heard on improved methods of cleaning linters and seed was discussed. It was questioned at that time how progress could be accurately measured (except by visual inspection and/or cellulose analysis). It was felt that this means was not wholly adequate for exchange of comparative information. In the economics of cottonseed crushing, one must remove all the second cut lint consistent with satisfactory sales. It was the feeling of this group that if some analysis could be developed which could give mill personnel an exact measurement of the lint quality being produced, that great strides would have been made.

Evaluation of Possibilities: How many of us present can go into our lint rooms and evaluate accurately the quality of lint being produced? Can we determine with some degree of accuracy how much we can increase our cut and still produce a salable product?

Thus for purposes of evaluation, let us assume that with such a means of determining quality - (1) we were able to continuously produce an acceptable product; (2) we could meet varying demands of the different consumers of this product; (3) by continually watching the results of this analysis, we could consistently produce the maximum weight of lint per ton of seed processed.

The above is the anticipated value to the cottonseed processor. Now what would be the value to the sales division and the buyer?

The sales division would have records on each bale or lot of lint in storage. They would know how many lots of each grade of lint were available. There would be no further need to send small samples of weekly production to the sales group for inspection.

To our consumers it would mean the purchase of a quality controlled product. If they bought 50 bales of Grade 2 lint, they would be reasonably certain of the foreign matter content in #/cwt. and the classification of this foreign matter.

Only through cooperation with those who come into intimate contact with this product can we determine the possibilities of such an analysis. Linters are meeting increasing competition in all fields of use. Contaminated lint will continue to face stiff resistance. The need is for a practical measuring stick, one that can be fully understood by all dealing with this product.

Proposed Method: The method currently under consideration by the A.O.C.S. is that of Rettger as was originally published in Oil & Soap 22, 7-10 (1945). Basically, it is proposed that a representative sample of the linters, "made friable (easily pulverized) by exposure to heat and volatilized hydrochloric acid, be brushed through a U.S. #50 mesh screen upon which the foreign matter is recovered for weighing and examination." The foreign matter can then be classified as desired. The relative quantities of hull bran, hull pepper, particles of stems and bolls can be determined by any of a number of methods.

Since Mr. Wells has prepared a history of the Rettger method and knows its present status, we will not go into further detail concerning it here. However, the results have been reported to be reproducible and give a rather satisfactory indication of lint cleanliness.

Questionnaire: In order to determine how the members of our organization felt concerning such a means of foreign matter measurement, a questionnaire was sent to a cross-section of some twenty people who attended last years' meeting here at the Southern Regional Research Laboratory. We asked these people for their comments on the following statements and questions:

1. Is some physico-chemical means for insuring lint salability desirable?
2. Supply any changes in the Rettger method which, to your thinking, might prove advantageous.
3. Suggest some other approach to the problem.
4. Is some measure of color other than is presently being used desirable?

Of those answering the questionnaire, the vast majority were in favor of a test similar to that proposed by Rettger. The majority felt that since this method was being considered as a tentative method by the A.O.C.S., that initiation of any work on a modification or totally different approach was not justified at this time.

Some of the group felt that it might be advisable to spell out in more detail the classification of the foreign matter removed, depending upon the ultimate use of the material. For example, if many of the shipments were going to the manufacturers of chemical cellulose, then the test should consist of a caustic digestion of this foreign matter to determine on a percentage basis that quantity which would remain in the purified product.

By discussions with other buyers of this products, similar additional foreign matter classifications could be agreed upon.

As far as color of second cut linters is concerned, there are, in general, two schools of thought:

1. The determination of color in second cut linters is neither desirable nor necessary unless the seed has been heat-damaged, in which case the off-color is evident.

2. Since color types do change with age and handling, that a standardized color system may be preferable to that used at present.

Opposition to the Proposed Method: Those in opposition to the proposed method, or a method similar in nature, had the following comments to make:

1. It was doubtful that the cost to the mill of grading this product could be justified.

2. The many changes in market conditions might make some grades of linters as defined by this method quite acceptable at certain times of the year and rejectable at other times.

3. A means of determination other than visual might be workable for linters intended for some users, but not for others.

4. There would be difficulty in the procurement of representative samples. It was felt that this method "would not accurately detect average components of all bales - such as dust pockets, shale and other objectionable ingredients in some bales and not in others, with respect to carloads or lots.

5. The proposed method could not be well performed without delaying shipments from the mills.

6. Many producers and buyers would not agree to abide by such a determination, at the destination.

In answer to those in opposition, we must point out several things that may have been overlooked.

As to the cost/bale or cost/ton, we do not know what this will amount to until we use it on an experimental basis. If the value of the information procured does not justify the cost of the analysis then some deviation should be sought.

As far as changing market conditions are concerned, we face that problem today and will continue to face it. It would seem that it would be under conditions such as these that a concrete grading system would be most useful. If our lint is made good enough by our research on seed and lint cleaning and we can accurately measure its quality through some standardized means of analysis, we cannot help but improve the demand for this product.

It is quite possible that the method as proposed will not be satisfactory to all the users of cotton linters as it stands today. It would be strange indeed, however, if all users did not prefer to purchase a product of controlled quality rather than a "pig in a poke."

Sampling may be difficult, but it certainly could be improved over our present methods. A definite sampling method could be set up for this product if it was found necessary to do so.

There is no reason why any unreasonable delay should be encountered with such a control program. The analysis is not particularly complex as it stands. A complete analysis could be run without difficulty in a twenty-four hour period. Quality analysis of continuously sampled linter production would probably be at hand within 48 hours after the samples were taken.

The statement that "many producers and buyers would not agree to abide by such a determination at the destination" is possibly premature. It again stands to reason that if the user can see that he is buying a quality controlled

product rather than a commodity, he would in all probability abide by such a determination.

Summary: The questions to be answered by this group are these:

1. Do the reasons listed in opposition to the proposed method constitute valid objections to the use of such a method?

2. Does the method as proposed offer sufficient value from the standpoint of rapid sales, known quality, and possibly increased production of linters per ton of seed, to justify attempted control by this means of an experimental basis?

3. Is color of second cut lint of sufficient importance to attempt better standardization?

It must be clear at this time that in order to have such a determination meet with any success, it will have to be 100 percent satisfactory to all those who deal in its production, sale and use. This product we call second cut linters has many properties which our present consumers find desirable - but only if they can be assured of the quantity and type of foreign matter it contains.

Recommendations: It is recommended that the following actions be taken by the Valley Oilseed Processors' Association.

1. Set up a full committee to actively evaluate this method, especially as it concerns research on new methods of seed and lint cleaning as soon as it is accepted as a tentative method by the American Oil Chemists' Society.

2. Request this committee to confer with the active users of second cut lint, with the thought in mind of defining quality standards for each group.

3. Submit a copy of this report as well as the answers to the questions posed in the summary to Mr. T. H. Hopper who is Chairman of the Seed & Meal Analysis Committee of the American Oil Chemists Society. We feel this group would like to know how the segment of the industry as represented by this group feels toward such a method.

Specific suggestions and constructive criticism will help this committee formulate that type of quality determination which will be of greatest benefit to the industry as a whole.

Discussion

Mays: It must be remembered that this method now gives the total amount of foreign material. It is, or will be, necessary to break this down into its components in some way, and we should know if this is important.

Loggins: Can all mills in the country produce a second-cut linters which is acceptable to all consumers?

Bremer: I would rather not say. I would guess yes for the majority of mills except in isolated cases where a property of the lint is wanted which your lint just does not have.

Loggins: The thing I had thought of was this. We know what our meal is to be used for. If we knew what our lint was to be used for, perhaps different sections of the country could make lint for specific uses.

Bremer: I do not know. Something might be done along that line if lint could be made to meet specifications.

Verdery: Many mills now have their own grading systems. Most operators cannot grade lint accurately but lint graders can. I think we are getting into a business that is out of our line in trying to grade lint.

Bremer: We would rather have something that can be written down and states percentages of hull pepper, bolls, shale, trash, etc. -- something easily

understandable so that all handlers of lint will be using the same grading system.

Allen Smith: A man who has been in the business 25 years has usually learned to grade lint -- this is too long. A chemical method could be learned by a laboratory technician in one day and duplicated all over the country. This would be an advantage. However, a lint buyer likes to see what he is getting. A chemical grading system would need to be correlated with the present system so that the two methods jibe.

Patterson: What about the small mill which has no laboratory?

Bremer: Samples could be sent to a commercial laboratory.

Patterson: From every bale?

Bremer: That would not be necessary. A representative sample from a lot should do.

SEED CLEANING

By
M. C. Verdery
Anderson Clayton & Company, Inc.

Although I do not normally recommend "looking back" and would prefer to "go forward," it seems there comes a time that it might be appropriate to review the results of past efforts so as to make better plans for the future.

I will therefore attempt to summarize briefly some of the accomplishments and conclusions made by your Committee on Seed Cleaning during the past two years, along with recommendations for the future. The highlights of last year's report will be summarized and comments made as to developments and improvements of the past year.

Last year it was pointed out that in order to appraise the relative merits of seed cleaning machinery it would be necessary to devise some effective and accurate means of sampling and analyzing the seed before and after cleaning to determine the percentage of trash removed. After many tests and hand picking of hundreds of samples the results would frequently be very discouraging, in that they were always erratic and inconsistent, in spite of all possible efforts toward accuracy. This one factor appeared to be a stumbling block toward progress in developing better seed cleaning machinery, in that it would certainly be difficult to make comparative tests with no means of appraising the efficiency of the machine.

The average results from three comparative tests, presented last year, are attached hereto on Table No. 1 to illustrate the irregularities in results due to improper sampling or variation of trash content in seed.

TABLE NO. 1

DOUBLE DECKED BAUER 199 AT 235 RPM

SAMPLE NO.	PERCENT REMOVAL FINES	STICKS	OTHER TRASH	TOTAL
1	90%	0%	48%	53%
2	85	33	24	42
3	87	(47)	23	19
4	91	(8)	53	50
5	89	(19)	46	38
6	88	(10)	20	18
7	89	4	35	31
8	88	40	40	47
Average	88%	(3)%	36%	37%
DOUBLE DECKED BAUER 199 AT 260 RPM				
9	81	14	59	59
10	82	27	33	43
11	88	44	48	59
12	84	(8)	80	60
13	88	37	33	40
Average	84	23	51	52
DOUBLE DECKED BAUER 199 AT 300 RPM				
14	90	52	50	58
15	89	54	48	59
16	87	71	74	74
Average	89	59	57	64

The results of these tests which, incidentally, are the average of three or four times as many samples as shown in the table, indicate reasonably well, in spite of irregularities, that the double decked Bauer cleaner is more efficient when operating at 300 RPM, but the principal object in presenting this information is to indicate the fluctuations in the analytical results, particularly in connection with the percentage of sticks and "other trash." For example, on the first test with the machine running 235 RPM, some of the results were actually negative in that they indicated a larger percentage of sticks in the clean seed than in the seed going to the cleaner. Also, the "other trash" percentage removal ranged from 20% up to 48%, which was obviously erroneous.

Last year we felt that by taking average results from a large series of tests, and where the difference in efficiencies were sufficiently conclusive, the experiments would give us some worthwhile information. However, all of us were very much concerned about this situation and felt that a much better procedure would have to be developed for determining the "percentage of

removal" by seed cleaning equipment. The tests made in Table No. 1 were from 21 grab samples taken before and after the cleaning machines. In an effort to obtain greater accuracy, it was decided to take larger samples of approximately 50 lbs., composited over eight hours and then quarter or riffle this sample down to approximately 2 lbs. This large sample was obtained by simply taking grab samples approximately every 30 minutes and then compositing and riffling down to a 2-lb. sample for analysis. The result of a comparative test of a Bauer double decked cleaner versus a standard cleaner in which this larger sampling procedure was used is tabulated in the following Table No. 2. Here again we have the considerable irregularities in percentage removal, particularly in connection with the stick removal ranging anywhere from 7% up to 52%. In spite of these extreme irregularities the averages of a large number of tests indicated a sufficient difference in favor of the double decked cleaner to convince us that it was certainly more efficient but it was again obvious that even with the much larger sample and longer sampling period we were still not getting accurate results.

During the past several months we have made a much more careful investigation of sampling in connection with seed cleaning tests and find that by careful supervision, accurate and reasonably consistent results may be obtained. To determine the efficiency or "percentage removal" of any seed cleaning machine we recommend tests of relatively short duration so as to avoid, as much as possible, changes in seed quality or trash content. We recommend tests of approximately 15 minutes duration and during the duration of the tests a man must constantly draw samples from the inlet of the machine, preferably under the feeder, and another man take samples at the discharge. With a Bauer seed cleaner this is best accomplished by passing a shovel or scoop back and forth through the stream of seed under the feeder and at the discharge. In this manner, with the seed being constantly sampled approximately 60 lbs. of seed will be accumulated before and after the cleaner. These 60-lb. samples should then be carefully mixed, spread out on the floor, and quartered. The quartered portion should then be remixed and again quartered on down to obtain three samples of approximately 2 lbs. each. Each of the three samples should then be screened to determine the content of sand and fine trash and then hand picked to arrive at the percentage of sticks and "other large trash." The results of a large series of tests using this sampling procedure are tabulated in Table No. 3.

TABLE NO. 2

BAUER DOUBLE DECKED 199 AT 300 RPM

SAMPLE NO.	FINES	STICKS	OTHER TRASH	TOTAL
1	86.9%	18.7%	57.3%	48.8%
2	88.9	33.8	57.7	53.7
3	90.5	30.3	50.6	50.7
4	89.1	46.9	43.1	51.5
5	88.1	28.7	55.1	46.9
6	93.1	52.0	57.1	60.7
7	87.5	48.0	49.6	57.7
8	90.6	34.4	59.3	56.7
Average	89.3	36.6	53.7	53.3
		STANDARD BAUER 199		
1	72.9%	31.7%	51.8%	55.8%
2	91.2	7.1	42.9	47.6
3	55.4	18.2	45.5	42.4
Average	73.2	18.9	46.6	48.2

TABLE NO. 3

	FINES	STICKS	OTHER TRASH	KNOBS	TOTAL	TOTAL F.M. IN SEED
	90.9	80.5	78.2	34.7	73.6	2.99
	75.0	84.3	78.9	2.8	71.1	2.70
	88.0	72.6	68.9	6.2	63.5	2.33
Average	84.6	79.1	76.0	14.6	69.4	2.67
	93.6	87.9	79.7	37.7	80.4	4.09
	95.8	85.9	73.3	-21.6	74.1	4.13
	94.5	81.6	79.0	34.6	78.2	3.99
Average	94.6	85.1	77.3	16.9	77.6	4.07
	93.0	81.1	78.8	22.0	76.1	3.35
	94.1	83.5	80.0	36.0	78.0	3.41
	93.8	80.5	72.4	12.8	72.6	3.07
Average	93.6	81.7	77.1	23.6	75.6	3.28
	93.2	79.5	77.4	22.4	73.2	3.17
	95.2	83.0	81.5	28.8	78.1	3.24
	96.5	88.2	72.8	28.6	77.5	3.15
Average	94.9	83.6	77.2	26.6	76.3	3.19
GRAND AVERAGE	91.9	82.4	76.9	20.4	74.7	3.30

It will be noted that on the test data shown in Table No. 3 that in addition to fine trash, sticks and "other large trash" that "knobs" have also been included. The reason for this additional segregation is that the "knob," which is the end of a stick or base of the boll, is sometimes attached to the stick as it enters the seed cleaner, but during the cleaning process is frequently separated and comes out in this form with the cleaned seed. This sometimes results in irregular test results, in that no "knobs" might show up in the seed to the cleaner and a larger percentage would be indicated in the clean seed.

It will be noted from this test data in Table No. 3 that the percentage removal of sticks as well as "other large trash" (usually burs), is amazingly consistent. The percentage of "knobs" is quite irregular, for the reasons pointed out above, but as the total percentage of "knobs" is relatively small it does not seriously affect the overall cleaning efficiency. In this particular case the overall efficiency or total percentage of removal ranged from 63.5% up to 80.4%, which is so much better than the test data shown in Tables No. 1 and No. 2 that we would not hesitate to recommend a standard procedure of this sort. Those of you who have made tests to determine the efficiency of seed cleaning machinery or studied the test data presented at last year's Clinic meeting will no doubt be surprised at the relatively high total percentage removal as indicated by the test data in Table No. 3. I would like to explain that these results were obtained by making a supplemental or

additional removal of sticks and "other trash" after having cleaned the seed in the usual manner with Bauer pneumatic cleaners. Some of you may have seen the experimental model of this new machine which was developed by one of ACCO's engineers and is now being tested in our Lubbock mill. It is still in the experimental stage and we have not yet decided exactly how it will eventually be applied to a seed cleaning process. It is obvious from this test data shown in Table No. 3 that it will do a much better job of removing sticks and large trash than any combination of existing equipment. This machine will no doubt eventually be developed into a complete unit, but for the present it would appear that it might be more practical and economical to utilize it as a finishing machine to remove certain fractions of foreign matter that we are now unable to separate from the seed with conventional equipment. I would like to point out again the percentage removal of sticks as shown in Table No. 3 which averaged 82.4%, whereas with conventional equipment we have not been able to remove more than 40% of the sticks.

We are still a long way from solving this problem and accomplishing a 100% job of cleaning cottonseed but quite a bit has been learned about the problem and considerable progress has been made.

I will tabulate below a few of my personal reactions and conclusions based on experience and observation after working on this seed cleaning problem for the past two years:

A. The conventional procedure for attempting to screen out large trash, i.e., sticks and burs, from cottonseed with reels or shaker screens as applied to pneumatic cleaners is entirely impractical and in many cases removes less than half of this type foreign matter. By doubling or tripling this boll screen area so as to use much smaller perforations, a much better job could be accomplished. Most mills are forced to use 5/8" or 3/4" round perforations in order to handle the load with a reasonable amount of equipment, thereby allowing a majority of the large trash to pass on through with the seed. Mills attempting to handle in excess of 75 tons of seed per day through a Bauer pneumatic cleaner, are forced to use 3/4" perforations or larger, and in such cases they will usually not remove more than 20% of the large trash. Some completely new procedure or entirely different machine, as mentioned above, will have to be developed in order to effectively remove sticks and burs.

B. On relatively dry seed, such as we handle at most of our Western mills it is a relatively easy job to remove sand and fine trash on the sand screen or lower tray of the pneumatic cleaner. However, I do not think that most of us realized the importance of this lower screen operation, and when properly clothed and not overloaded it will remove a tremendous volume of short broken sticks and small pieces of broken burs. This lower tray will remove in the neighborhood of 90% of extremely fine trash even when handling in excess of 75 tons per day on one tray, but will not effectively remove the short broken sticks, etc., under these heavily loaded conditions. After having developed the proposed supplementary equipment for removing large sticks and burs, it will still be necessary to provide ample lower tray screening area to remove the medium sized foreign matter mentioned above.

C. In view of the importance of this sand screen operation, as outlined in B above, it is most important that every effort be made to obtain maximum efficiency from this particular screening operation. This sand screen on any seed cleaner should definitely be equipped with the Ro-Ball ball attachments which will prevent clogging of the perforations. It is also important that the most effective perforated metal should be used and that it be maintained in good condition. We recently encountered one mill that was using a non-standard

herringbone screen which did not employ the maximum of perforations, and by substituting the proper screen they were able to obtain 30% more screen area with the same size 1/8" x 1-1/2" herringbone metal. Several mills have experimented with special wire screens with longitudinal rods to replace the conventional herringbone metal, and although it appears that this would give greater screening area and more effective results, we have seen several comparative tests in which the standard herringbone metal removed a larger percentage of small trash.

With your Clinic Committee on Seed Cleaning cooperating with a committee appointed last year by the International Oil Mill Superintendents' Association, and with both of these committees ably assisted by the Southern Regional Research Laboratory and the Experimental Laboratory at A & M College, we are all looking forward to continued progress and to eventually solving this difficult and interesting problem.

Discussion

Brawner: How many tons of seed does each pneumatic cleaner process per day?

Verdery: About 70, but balls are absolutely necessary.

Roberts: Do you have any trouble with the balls clogging up the trays?

Verdery: No, that is the purpose of the balls, to keep the trays unclogged.

Loggins: They don't work that way in my machines. Did you ever look at them and the lint they collect after about 3 days operation?

Verdery: That does not happen in my plant. You must be using the wrong kind of balls.

Brawner: We also have the same trouble -- lint collecting on the balls.

Holzenthal: Have you tried recycling?

Verdery: Yes, we get a few more percent of trash that way.

Holzenthal: The problem is to get that last few percent out. That is the real problem.

USE OF BASKET-TYPE SEED CLEANERS

By
C. R. Campbell
C. R. Campbell Company

The subject of my discussion is the use of basket-type seed cleaners, and I will elaborate on the single basket units or supplemental cleaners.

The basket cleaner is manufactured for two applications -- one a shaker pneumatic aspirator type seed cleaning unit -- Camco No. 20, and the other a first-cut delinting machine -- Camco No. 18. The photographs illustrate these two cleaners. The No. 18 Cleaner is designed to mount on the delinting machine fron post and receives the seed from the delinting machine grate fall. The spike shaft assembly revolves over slotted perforated metal and the foreign material passes through the metal openings and the cleaned seed are discharged in the existing seed conveyor. The No. 20 Cleaner application is similar. The speed of the cleaners is varied in relation to the load, averaging from 80 RPM to 100 RPM on the No. 18, and from 100 RPM to 150 RPM on the No. 20.

The No. 20 (Bauer Unit) basket-type cleaner installed in a West Texas oil mill removed two pounds of foreign material per ton of late seed worked at the rate of 75 tons of seed per 24 hours, and in the same mill the No. 18 (Carver

first-cut linter) basket-type cleaner removed six pounds of foreign material per ton of late seed worked at the rate of 25 tons of seed per 24 hours. The foreign material in each instance consisted largely of stems or sticks.

The qualitative seed analyses at mills in some locations will reveal from minus one percent to plus six percent foreign material. The existing seed cleaning machinery in the average mill is incident to the processing operation and, not being flexible, cannot effectively clean seed with such a verying percentage of foreign material.

In conclusion, it is my opinion that the mills can expect a larger percentage of rough seed as mechanical cotton harvesting increases, and the usual bolly seed in the northern fringe of the Cotton Belt. The mill operators have the alternative of providing additional major seed cleaning machinery for the adverse condition of rough, bolly seed, and by so doing creating an unsound economic burden when processing good seed, or providing supplemental cleaners to the existing equipment.

Discussion

Brawner: The amount of trash removed appears small. However, a very small amount of fine trash in the lint will degrade it.

Verdery: About 0.2% is enough.

Ralph Woodruff: The most significant results of tests at Osceola were to show up the very small amount of seed trash which will degrade lint. I have here some actual quantities of trash which were removed from one-ton lots of seed. (Mr. Woodruff displayed a group of trash samples weighing about 2 to 3 ozs.) Even this small amount of trash cuts the grade of the lint sharply.

Allen Smith: Why can't Ralph put the cleaners ahead of the first cut linters?

Ralph Woodruff: We thought of that and are thinking of putting them ahead of our Bauer cleaners. However, we have had most of our trouble with second cuts and little if any with the first cuts.

RESULTS OF TESTS ON BASKET-CLEANER ATTACHMENTS FOR FIRST-CUT LINTER MACHINES

By
Ralph Woodruff
Osceola Products Company

These are the results of the tests on basket-cleaner attachments for first-cut linter machines, which tests were begun November 3, 1953, and completed January 26, 1954.

The most significant feature of this work, at least to us, was the large quantity of bulk that a few ounces of material in weight would present, as shown by the samples exhibited at the meeting today. (For previous mention of exhibit see discussion following Mr. C. R. Campbell's paper above.)

BASKET CLEANERS TESTS

Date of Test	Mill Tonnage Per 24 Hours	Pounds of Second Cut Lint Produced 30 Minutes	Foreign Matter In Seed Processed	Quality of Lint Produced	Percent Cellulose Second Cut	Percent Lint On Seed	Percent Residual Lint	Trash Removed Ounces	Ounces Motes Removed	Ounces Meats & Immature Seed Removed	Pounds Seed Delinted Per 30 Minutes
11-3-53	195	524	.0%	6 High	80.8	11.5	1.7	2.79	50.0	1.90	8125
11-17-53	177	511	.1%	6 High	79.1	11.0	1.6	10.29	61.0	11.00	7375
11-24-53	177	430	.2%	6 High	78.0	10.8	1.5	17.85	34.0	21.13	7375
12-8-53	145	504	.3%	6 Middle	78.3	11.3	1.4	32.40	88.0	30.40	6042
12-15-53	187	507	.3%	6 Middle	79.4	11.1	1.7	38.66	32.0	54.82	7792
12-29-53	153	412	.2%	6 Low	77.7	11.2	1.6	23.28	36.0	40.92	6375
1-6-54	188	496	.3%	6 Middle	77.4	10.8	1.2	13.82	32.0	48.60	7833
1-13-54	185	496	.2%	6 Middle	74.8	10.3	1.4	25.04	38.0	62.50	7708
1-19-54	177	422	.1%	6 Middle	74.3	11.0	1.1	4.30	40.0	32.38	7375
1-26-54	176	505	.3%	6 Low	76.0	11.2	1.7	17.70	24.0	14.32	7333
Average	176	481	.2%	6 Middle	77.6	11.0	1.5	18.61	44.0	31.80	7333

STATEMENT

By
Ralph Woodruff
Osceola Products Company

Mr. Woodruff stated that the committees on seed and lint cleaning would be consolidated into one under the chairmanship of Mr. Brawner with Mr. Allen Smith as assistant. He then invited the members to present their views on new ideas for research work.

Suggestion

Mr. K. B. Smith suggested that saw speed vs. linter quality be investigated. He has observed that slow saw speeds seem to result in better quality linters.

REPORT ON JET-TYPE CLEANER

By
Allen Smith
Perkins Oil Company

In Marketing Research Report No. 56, Mr. Marion E. Whitten and Mr. Joseph H. Stevenson under the direction of Mr. John W. Wright have prepared a most complete study of cotton linters. You, who are interested may secure this report from the Superintendent of Documents, U. S. Government Printing Office, Washington D. C.

Without giving a complete review of this survey it is well, I think, to mention here that Report No. 56 covers three phases of cotton linters in detail -- first, factors affecting linters production; second, marketing of cotton linters; and last, market outlets for cotton linters. Now, if you will read this report at your leisure, we will have saved this program about an hour's time.

This Clinic has dealt primarily, from the operators point of view, with the cleaning of cottonseed. Our main objective has been toward improving production of both quantity and quality of cotton linters. We realize that if we had clean seed to start working with, most of our lint room problems would automatically be solved. Knowing this is not the general condition, the planners of this Clinic set about doing or at least studying first things first. In our first two meetings it was learned that in most areas our present seed cleaning equipment is removing less than 60% of the total foreign material from cottonseed. This figure includes sticks, fines, and other trash. I doubt if any equipment will remove more than 45% of sticks and other trash only. This is especially true when the cleaning machinery is overloaded, a condition that exists in most mills today.

This past summer we bought an extra shaker to help relieve the overload condition existing in our cleaning room. If you remember from my previous paper, we have only two Bauer Bros. cleaners following our sand and boll reels. To date, we have not gotten the extra shaker installed. However, this summer we plan to not only install this shaker but to convert it to a Bauer Bros. cleaner which I believe will do a better job. Our mill capacity is 150 tons per day. This will be only 50 tons per cleaner instead of 75 tons per machine as of today.

Our first cut linters have always been a problem. This problem seems to exist even though we cut less than what is cut at our plant in West Memphis. At Perkins we have the flue system and at West Memphis we have the individual

condenser types of linters. To date we have not overcome the price differential even though the cut per ton is less or if our linters contain a higher cellulose content.

In an effort to correct this condition, we installed a Carver regular lint beater and in addition to this, we also installed a Carver Jet machine. Our system is so arranged that the first cut lint can be made to travel several different routes before reaching the baling press. By this arrangement we can (A) by-pass both the Jet and beater, (B) by-pass the Jet only, or (C) by-pass the beater only.

In a limited manner we have tried to test the merits of the Jet and beater. At this time it may be well to describe the Jet before giving you the results of the test. As the lint comes from the linters, it is carried upward and over an agitating cylinder. This cylinder gently agitates and fluffs up the lint, providing an ideal condition for perfect cleaning. This cylinder operates so that rim speed of discs on the cylinder is approximately twice the velocity of air which is conveying the lint at this point. It speeds up and directs the flow of lint to the moting point and stripper bar, and with the proper velocity to give the most separation. At this point, leaf trash, grass, motes, and fine particles are separated from the lint, and deposited in our regular second cut motes, while the air carries the lint into the lint flue and on up to the beater or baling press.

Also, before we study the test results, please keep in mind that it is a very difficult matter to take an absolutely representative sample of seed. By this, I mean taking a sample before cleaning, then after cleaning, and being sure that the lint that is baled came from that particular lot of seed. Again, you can appreciate the fact that it is easier, and the results, no doubt, would be more reliable if this test could be done in the laboratory. Sorry, we do not have a small model or laboratory equipment. However, we do have the results obtained from the full size machine.

Each day we ran the test, we tried to keep a constant supply of the same quality and type of seed going through our plant while that particular test was being made.

From the data sheet (on the next page) you will note, for the first test run, the amounts of fines, sticks, and other trash in the seed before and after cleaning were determined. During the other tests, samples were taken after the cleaning room operation and we have taken the liberty to calculate what the original total foreign matter would have been had the cleaning equipment removed only 45% of the foreign matter. For practical purposes and for reasons previously stated I believe this procedure serves our conditions better than to have made the actual determination. Again, we can say with certainty as has been stated here at our previous meetings, "Our first cut linters are the best seed cleaning device that we have in the oil mill." When processing seed that contains a high foreign matter content, much of the sticks and other trash is carried over into the lint which we wish to sell for a good price.

In cooperation with the Carver Gin Company and with the assistance of Mr. Long and Mr. Hamlett, we have tried to remove the excess sticks and other trash from our first-cut lint by the use of the Jet and beater.

Date of Test	COTTON SEED MILLED								MOTES		
	Before Cleaning				After Cleaning				Motes & other Trash Removed from Lint #/Ton Seed		
	% Fines	% Sticks	% Other Trash	% Total F.M.	% Fines	% Sticks	% Other Trash	% Total F.M.	(Reg.) Linter	Jet	Beater Oz./Ton
1-15-54	0.38	0.57	0.47	1.42	0.06	0.24	0.54	0.84	11.5	1.2	0.2
	0.53	0.34	1.02	1.89	0.06	0.35	0.87	1.28	15.4	-	1.2
1-25-54	Estimated at 45% Removed			*1.2	0.05	0.31	0.30	0.66	-		
				*1.4	0.07	0.31	0.38	0.76	-	1.2	
				*1.9	0.06	0.38	0.60	1.04	-	1.3	
				*1.9	0.05	0.43	0.56	1.04	-		
1-30-54				*0.3	0.05	0.04	0.08	0.17	-	0.67	
				*0.3	0.05	0.05	0.06	0.16	-		
				*0.4	0.05	0.07	0.11	0.23	-		

*Denotes - Total F.M. Estimated at 45% removed.

Date of Test	LINT Wt. of 1st Cut Lint #/Ton Seed Milled	Special Motes, Trash, Faulty Seed, etc. (Seed Fall)	FIRST CUT LINT Marks	Order in Physical Appearance	Grade (U.S.)	Price /# Cents	Process Markings
1-15-54	51	-	1-A	#1	3L	6	With Jet and Beater - 243 RPM
	63	-	1-B	#3	3L Sl.Tr.	6	Without Jet - With Beater-243RPM
1-25-54	80		2-A	#8	4M Sl.Tr.	5	With Jet and Beater - 243 RPM
	91	1.9	2-B	#9	4L X Tr.	5	With Jet Without Beater
	77		2-C	#6	4L Sl.Tr.	5-1/2	With Jet and Beater - 223 RPM
	81		2-D	#7	4M Sl.Tr.	5-1/4	Without Jet With Beater-223RPM
1-30-54	61	-	3-A	#4	4H	6	With Jet and Beater - 223 RPM
	58	-	3-B	#2	3L	6	Without Jet With Beater-223RPM
	74	-	3-C	#5	4M X Pepper	5-1/2	With Jet Without Beater

Mr. W. C. Manley, Jr. graciously consented to grade and class each of the samples taken in this series of test runs. He did, I think, a good job too.

By looking at the data sheet you will find the order in which the lint was graded and classed by Mr. Manley. This data may or may not, due to limited number of tests, be a true representation of what you would obtain from a series of many different tests. In other words, I do not believe one could say at this time, for sure, just which method to follow if one should use either or both of the machines. If these tests are reproducible then it would be a simple mathematical problem to determine how much or how little cleaning we should give our first-cut lint in order to gain the highest profit. Let us take the figures we have, and see if we can establish any correlation between the weight of lint per ton of seed and the grade-price per pound. By inspection you will note that all weight figures check the grade-price figures given by Mr. Manley with only one slight exception. This is between samples marked 1 - B and 3- A. We reported 63 pounds against 61 pounds. The grade-price is 3 L against 4 H. The price per pound is the same in each case so I do not suppose there is really any difference after all.

One more observation, then I shall stop and let you ask questions if you wish. I am sure that Mr. Manley and I will try and answer those that we can.

The observation is this - taking the cut per ton and its corresponding expected price as a basis, the value of first-cut lint is in direct proportion to its weight. This is true in all tests except 2 - C and 2 - A, in which we have three pounds difference in weight and 23-1/2¢ difference in value.

In conclusion - let me restate the observation by saying -- you get the highest returns for your first-cut linters by cutting the maximum amount possible, because the price per pound does not decline in proportion to the gain in weight.

Discussion

Brawner: How important is trash in first cut linters?

Manley: It is not too important. Its importance depends upon the kind and quantity of trash. Regular trash normal to first-cut linters does not make too much difference. Of course, excess trash does bring the price down, but the price is governed more by the fiber length and the color than anything else.

NEW SEED COTTON CLEANING EQUIPMENT AND ITS EFFECT ON THE QUALITY OF COTTONSEED

By

Charles C. Speakes
U. S. Cotton Ginning Laboratory

Research in the many phases of cotton ginning is helping to preserve the inherent quality of cotton fiber and cottonseed. Developments made at the Stoneville, Mississippi, Mesilla Park, New Mexico, and Chickasha, Oklahoma, Cotton Ginning Laboratories have come in the form of new devices such as drying systems now generally used by industry, feed rate controllers, improved lint cleaning mechanisms, boll and rock traps, and a stick and stem remover still in the experimental stage. Developments have also come through research on commercial machinery, of recommended machine types and combinations of machines for specific kinds of cotton, and on recommended installation and operating

practices. As a general rule the cottonseed industry benefits from improvements made in ginning. In addition, the laboratory has done extensive work on a cottonseed drier-cleaner and other problems affecting the quality of cottonseed.

Laboratory tests and surveys show that a typical mid-season handpicked Mississippi cotton contained 51.8 pounds of trash per bale when it reached the gin. When this particular type of cotton was processed through only one drier and cleaner overhead it still contained 8.9 pounds of trash upon entering the seed roll, but when a bur extractor was added to the line the trash content was reduced to 1.2 pounds.

A simple cleaning arrangement, used in ginning typical Mississippi mid-season machine picked cotton containing 71.0 pounds of trash per bale, allowed 22.8 pounds of trash to enter the roll box. A more elaborate arrangement reduced the amount to 16.2 pounds.

Effects of cleaning are even more apparent on the hand snapped and machine stripped cottons produced in Oklahoma. Tests conducted on typical bales of snapped cotton showed a foreign matter content of 492 pounds on the trailer. With a simple cleaning system 7.2 pounds reached the seed roll box, but the amount was reduced to 1.4 pounds by a modern and more elaborate system. The trash content of machine stripped cotton with as much as 1319 pounds of trash in the trailer was reduced to 62.3 pounds by minimum cleaning, but a modern system in general use in that area reduced the trash content entering the roll box to 29.4 pounds.

A constant source of trouble to ginners and seed processors alike is the presence of sticks and stems in hand snapped and machine stripped cottons. The problem is growing more acute as cotton of this type is encountered in increasing volume in several areas of the Cotton Belt. Such raw material increases gin maintenance costs and decreases ginning capacity, because the sticks collect in the seed roll and the stands must be stopped periodically to empty the rolls. The roll is dumped into the seed conveyor and the problem consequently is passed on to the oil mill.

A major portion of the current research work on lint and seed cleaning is directed toward alleviating the stick problem. A stick and stem remover, developed through research on several principles of extraction, is now under test and further modification at the Stoneville and Chickasha laboratories. Although the machine was designed principally for snapped and stripped cotton, preliminary tests have indicated that there may be a place for the device in gins geared to handle machine picked cotton. The construction of the machine is relatively simple, and should its effectiveness match expectations, it should prove a valuable addition to the modern well equipped gin.

This machine consists of four integrated units containing a saw cylinder, which carries the cotton over a series of grid bars, and a brush to doff the cotton from the saw. The unit is quite effective in extracting burs and light trash as well as sticks. It is too early to report any reliable performance data, but it can be said that a very high percentage, by weight, of the trash contained in Mississippi and Oklahoma stripped cottons was removed in the early tests and the preliminary results are most encouraging. Research is continuing at both laboratories, and mechanical changes are being made as need is indicated by analysis of the results. Public patent applications have been filed, and gin machinery manufacturers are showing a great deal of interest in the unit.

Research and experience have shown that the effectiveness of seed cotton cleaners and extractors is impaired when the equipment is fed cotton at excessive rates. Overloading is common at gins because cotton is fed into the entire drying and seed cotton cleaning system at the discretion of the man unloading the trailer.

During the past three years a device for controlling the rate at which cotton may be fed to the ginning system has been developed and tested at Stoneville. The suction man's only responsibility is to keep a hopper filled with cotton and the machine feeds it into the ginning system at a controlled rate. The rate of flow is adjusted by the ginner so that there is enough cotton in the system to adequately supply the gin stands. With feed control devices, now being manufactured commercially, the ginner is assured that his cleaners are operating at peak effectiveness within the capacity of the gin stands. Other major advantages of feed control are that "down-time" from chokages caused by overloading and slugging are eliminated, and impaired fiber quality, excessive bale weight loss and two-sided bales caused by overflow are minimized.

Modern gin plants are incorporating many features other than seed cotton cleaning which are helping preserve the quality of cottonseed. For instance, it was formerly common practice to use the exhaust of the trailer unloading fan to convey seed to storage and consequently a considerable amount of sand, dust and light trash was sent to the oil mill. This practice is disappearing as gins are being built with recommended separate seed blowing or screw conveying systems.

Trash removal systems have been greatly improved and recommended layouts provide a means for removing gin huller front trash and motes entirely separate from the seed conveyor. Improvements in stand design have minimized the loss of cotton and seed in the huller front. These developments and the laboratory's educational program are virtually eliminating the ginner's tendency to dump gin stand trash into the seed.

As has been reported in the past, the laboratories are developing a cotton-seed drier-cleaner as a gin appliance. This has given some very promising results. The unit was designed principally as a means of saving valuable planting seed stocks which formerly were oil milled because of the high moisture content. It has also produced favorable results on seed for oil mill use. Field tests of the drier-cleaner on a commercial basis have been delayed by two exceedingly dry seasons in succession and sufficient data for a comprehensive report have been unobtainable.

This discussion may be summarized as follows:

1. The results from research and development in the field of seed cotton cleaning will continue to benefit cottonseed processors, producers and ginners alike. Due to present marketing practices, the primary interest of the producer and ginner is to obtain the highest lint value possible, but any trash removed overhead is prevented from entering the cottonseed and enhances its value. Seed cotton cleaning might be termed "trashy seed prevention."
2. Although much remains to be accomplished, the modern gin is capable of producing cleaner cottonseed from trashy cotton than its counterpart of a decade or more ago. Laboratory research is directed toward alleviating the problem presented by rough harvesting practices to all phases of the cotton industry. The development of a stick and stem extractor now under laboratory test is expected to be of significant value.

3. Cottonseed is being handled more carefully in the gin as a result of improved trash disposal systems and educational programs directed at operational procedures.
4. Since overhead driers and cleaners have no appreciable effect on the moisture and free fatty acid content of seed, a cottonseed drier-cleaner for gin use was developed and is being tested. Exceedingly dry seasons have delayed the completion of field tests, but laboratory test results are very favorable.

Discussion

Brawner: Could this new idea be applied to seed cleaning?

Speakes: No, it is suitable for the gin only, as it depends on the long lint for operation.

Unknown: What are the essential requirements of a modern gin?

Speakes: We consider the following adequate in the following order: dryer, screen cleaner, bur extractor, 3 or 4 more screen cleaners, extractor feeder and lint cleaner. In West Texas other units might be required.

A GENERAL DISCUSSION

Led By

J. H. Brawner
Southern Cotton Oil Company

participated in by
most of those in attendance

SUBJECT: SUMMARY OF BEST LAYOUT, CAPACITIES AND OPERATING CONDITIONS FOR SEED-CLEANING EQUIPMENT

Mr. Brawner spoke briefly concerning the apparent need for new types of seed-cleaning equipment employing new ideas and approaches to the problems and re-emphasized the importance of making the best possible application of existing types of seed-cleaning and delinting equipment. He then suggested that it might be well to summarise the best layout, capacities and operating conditions for seed-cleaning equipment.

After considerable discussion, in which most of those present participated, the following tabulation was written on the blackboard by Mr. Brawner and seemed to be the consensus of opinion of those present.

A. Reel for grabs: One 24 ft. reel with 1/2-inch opening can handle about 100 - 200 tons of seed per day.
B. Pneumatic cleaner: One standard pneumatic cleaner with balls per 35 - 50 tons per day or one double deck cleaner per 70 tons per day.
C. First Cut Linters:
   1. Eastern Area - one linter per 16 tons of seed.
   2. Western Area - one linter per 25 tons of seed.

   To adjust for market and seed conditions, it is recommended that a saw speed of about 400 rpm be used to allow for flexibility. It is very desirable to be able to adjust the peripheral speed of the saws.

Saw-float speed ratio recommended by manufacturers should be 85-90% of the saw speed. Several operators expressed opinions that saw-float speed ratios up to 100-110% of the saw speed improved their lint quality.

D. Second Cut Linters: The number of second cut linters required should possibly be based on the production of about 1000 lbs. of lint per linter or have one linter for about 7.2 tons of seed with first cut linters removed.
Saw speeds required for thick hull seed should be between 700-725 rpm whereas the saw speeds for thin hull seed should be between 600-650 rpm.
Saw-float speed ratio should be about 85-90% of the saw speed.

Discussion

Ralph Woodruff: Will installation of extra decks (screens) throw the shaker capacity out of balance with the air chamber capacity?

Verdery: No, the same air chamber is adequate with the double decked shaker.

Ralph Woodruff: Mr. Baldwin, will you pass on to us a few remarks on chemical linters?

Baldwin: The chemical linters trade will be lost in the near future unless the quality of linters is greatly improved.

There are two sources of contamination:

1. Field trash.
2. Hull pepper.

The first can be eliminated by proper cleaning. The second by correct adjustment and regulation of the saws.

(Referring to a previous statement in Mr. Bremer's paper, Mr. Baldwin continued by saying:) Chemical determination of trash will require evaluation as some portion of the trash which is fumed along with the lint, will be rubbed through the screen with the lint.

RESOLUTIONS

February 16, 1954

The following resolutions were presented by Mr. J. B. Perry, Jr. to the Association, and they were unanimously adopted:

1. BE IT RESOLVED: That the members of the Cottonseed Processing Industry in the Valley take this means of extending deep appreciation to the program chairmen, Mr. Fred M. Wells, and Mr. J. H. Brawner, and the members of their committees, as well as those who helped plan and are taking part in this program. Particularly do we express our thanks to Mr. Ralph Woodruff, President, and Mr. Clarence E. Garner, Executive Secretary, of the Valley Association.

2. BE IT RESOLVED: That those attending this Oilseed Processing Clinic wish to extend deep appreciation to Dr. Charles H. Fisher and the staff of the Southern Regional Research Laboratory, with particular recognition to Dr. A. M. Altschul, Head of the Oilseed Section, and Mr. E. A. Gastrock, Head of the Engineering and Development Section, and their respective staffs for their fine contributions to the conference we are now concluding and for the many courtesies extended those in attendance.

3. BE IT RESOLVED: That a continuing broad research program is considered of major importance to the farmer, to the oilseed processing industry, and to the consumer, and that the Southern Regional Research Laboratory be highly commended for its efforts and achievements to date and that it be strongly urged to continue in further research and engineering development to improve the quality and yield of the products of the oilseeds of the South and to reduce, if possible, the cost of their manufacture. It is considered that one of the immediate problems is the cleaning of the raw cottonseed before manufacturing and the cleaning and improvement of the quality of the linters from cottonseed with a view to broader utilization of this product.

4. BE IT RESOLVED: That the Research Committee of the Valley Oilseed Processors' Association as now constituted become a permanent organization to continue to cooperate with the Southern Regional Research Laboratory in the research program outlined in Resolution 3 above.

Signed: ______________________________
J. B. Perry, Jr., Chairman
Resolutions Committee, V.O.P.A.

APPENDIX

PROGRAM

February 15, 1954 - 9:30 a.m. — Chairman, J. A. Kime, SURB
Auditorium - Third Floor

1. 9:30 a.m. Welcome - C. H. Fisher, Chief, SURB

2. Response - Ralph Woodruff, Osceola Products Co., Osceola, Ark. President, V.O.P.A.

3. 10:00 a.m. Newer Knowledge About Cottonseed Processing As It Affects the Quality of the Oil and Meal
A. M. Altschul, Head, Oilseed Section, SURB

4. 10:30 a.m. Laboratory Experiments on Cooking of Cottonseed to Produce Improved Meals and Oils
F. H. Thurber, Oilseed Section, SURB

5. 11:00 a.m. Laboratory Experiments on the Use of Special Reagents to Improve Color of Cottonseed Oil
J. M. Dechary, Oilseed Section, SURB

6. 11:30 a.m. Screw Pressing of Cottonseed
Cecil Wamble, Manager, Cottonseed Products Research Laboratory, Texas Engineering Experiment Station, College Station, Texas

12:30 p.m. Luncheon - S.R.R.L.

<u>February 15, 1954 - 1:30 p.m.</u> Chairman, <u>J. A. Kime</u>, SURB
<u>Auditorium - Third Floor</u>

7. 1:30 p.m. Current Status of the Commercial Application of Filtration-Extraction to Cottonseed and Soybeans
<u>H.L.E. Vix</u>, Engineering and Development Section, SURB

8. 2:00 p.m. Extension of the Filtration-Extraction Process to Minor Oilseeds of the South
<u>E. A. Gastrock</u>, Head, Engineering and Development Section, SURB

9. 2:20 p.m. Economic Value of Linters to Mills and to the Farmer
<u>J. F. Moloney</u>, Asst. to Executive Vice-President, NCPA

10. 2:50 p.m. Report on Survey of Problem of Cleaning Cottonseed and Linters and Preliminary Experimental Results
<u>L. L. Holzenthal</u>, Engineering and Development Section, SURB

<u>February 16, 1954 - 9:00 a.m.</u> Chairman, <u>Ralph Woodruff</u>, VOPA
<u>Auditorium - Third Floor</u>

11. 9:00 a.m. In memory of F. P. Wallace
<u>Ralph Woodruff</u>, Chairman

12. Report by the Sub-Committees on Lint Cleaning and Cottonseed Cleaning
<u>J. H. Brawner</u>, Chairman, Sub-Committee on Cottonseed Cleaning, VOPA

13. 9:30 a.m. Desirable Characteristics of Linters for Various Purposes
<u>Marion Mann</u>, Williamson, Northrup Co., Inc., Atlanta, Ga.

14. 10:00 a.m. Desirable Characteristics of Linters for Paper Manufacture
<u>B. B. Annis</u>, Ward Voss and Associates, Memphis, Tenn.

15. 10:30 a.m. The Value of a Physico-Chemical Method in the Determination of Second Cut Linters Quality
<u>J. W. Bremer, Jr.</u>, Swift and Co., Chicago, Ill.

16. 11:00 a.m. Seed Cleaning
<u>M. C. Verdery</u>, Anderson, Clayton and Co., Inc., Houston, Tex.

17. 11:30 a.m. Use of Basket-Type Seed Cleaners
<u>C. R. Campbell</u>, C. R. Campbell, Co., Dallas, Tex.

18. 12:15 p.m. Results of Tests on Basket-Cleaner Attachments for First-Cut Linter Machines
<u>Ralph Woodruff</u>, Osceola Products Co., Osceola, Arkansas

February 16, 1954 - 1:30 p.m. Chairman, Ralph Woodruff, VOPA
Auditorium - Third Floor

19. 1:30 p.m. Report on Jet-Type Cleaner
Allen Smith, Perkins Oil Company, Memphis, Tenn.

20. 2:00 p.m. New Seed Cotton Cleaning Equipment and Its Effect on the Quality of Cottonseed
C. C. Speakes, U. S. Cotton Ginning Laboratory, Stoneville, Miss.

21. 2:30 p.m. Summary of Best Layout, Capacities and Operating Conditions for Seed-Cleaning Equipment
J. H. Brawner, Southern Cotton Oil Company, New Orleans, La., led this general discussion

22. 3:30 p.m. Resolutions

23. 4:00 p.m. Adjournment

ATTENDANCE LIST

Andrews, J. P., Lukens Steel Co., Coatesville, Pa.
Annis, Burton B., Ward Voss and Associates, Forest Hill, Memphis, Tenn.
Bailie, G. E., Wurster & Sanger, Inc., 5201 S. Kenwood, Chicago, Ill.
Baker, T. H., Jr., Trenton Cotton Oil Company, Trenton, Tenn.
Baldwin, W. D., Hercules Powder Co., Memphis, Tenn.
Barker, T., American Mineral Spirits Co., 619 Plaza Bldg., Jackson, Miss.
Barton, R. C., The Forrest City Cotton Oil Mill, Forrest City, Ark.
Berkley, E. E., Anderson Clayton Co., Houston, Texas
Blalock, Hill, Riverside Oil Mill, Marks, Miss.
Brawner, J. H., Southern Cotton Oil Co., 210 Baronne St., New Orleans, La.
Bredeson, Dean K., V. D. Anderson Co., Forst Worth, Texas
Bremer, J. W., Jr., Swift & Co., Union Stock Yards, Chicago 9, Ill.
Brooke, Tom R., French Oil Mill Machinery Co., 146 17th St., Atlanta, Ga.
Byram, J. E., Jr., Red River Cotton Oil Co., Inc., Alexandria, La.
Caldwell, C. H., West Memphis Cotton Oil Mill, West Memphis, Ark.
Campbell, C. R., Chas. R. Campbell Co., P. O. Box 1642, Dallas, Texas
Campbell, Stewart, Chas. R. Campbell Co., P. O. Box 1642, Dallas, Texas
Carter, Clyde L., Eng. Expt. Sta., The Univ. of Tenn., Knoxville, Tenn.
Covington, H. E., Miss. Cottonseed Products Co., Box 939, Jackson, Miss.
Durham, Warren A., National Blow Pipe & Mfg. Co., P. O. Box 67, New Orleans, La.
Dwyer, John J., Orkin Exterminating Co., Inc., Orkin Bldg., 713 W. Peachtree St., Atlanta, Ga.
Fleming, I. H., Jr., De Soto Oil Co., Memphis, Tenn.
French, A. W., French Oil Mill Machinery Co., Lock Box 920, Piqua, Ohio
Gandy, Dalton E., Educational Service, National Cottonseed Products Association, P. O. Box 286, Tech. Station, Ruston, La.
Garner, C. E., Valley Oilseed Processors' Association, Inc., 1024 Exchange Bldg., Memphis 3, Tenn.
George, Ernest, Jr., Imperial Cotton Oil Company, Macon, Miss.
Graebe, H. C., Carver Cotton Gin Co., East Bridgewater, Mass.

Hamlett, J. R., Carver Cotton Gin Co., 146 E. Butler St., Memphis 2, Tenn.
Harris, Hal, Planters Cotton Oil Co., Greenwood, Miss.
Hayne, W. P., Independent Mill and Gin, Inc., Alexandria, La.
Heath, B. W., Producers Cooperative Oil Mill, Oklahoma City, Okla.
Hicky, James, Forrest City Cotton Oil Mill, Armour & Co., Forrest City, Ark.
Hodges, Lawrence H., Barrow-Agee Laboratories, Inc., Memphis, Tenn.
Hoover, I. M., Cotton Products Co., Inc., Opelousas, La.
Howard, N. F., Planters Oil Mill, Greenwood, Miss.
Jenkins, Alfred, Delta Cotton Oil & Fertilizer Co., Jackson, Miss.
Loggins, R. L., Blytheville Cotton Oil Co., Blytheville, Ark.
Manley, W. C., Jr., 811 Falls Bldg., Memphis, Tenn.
Mann, Marion, Williamson, Northup Co., Inc., Box 1305, Atlanta 1, Ga.
McClure, Orville M., Southern Chemical Cotton Co., Chattanooga, Tenn.
May, Ralph, The Union Oil Mill, Inc., West Monroe, La.
Mays, J. R., Jr., Barrow-Agee Laboratories, Inc., Box 156, Memphis 1, Tenn.
Moloney, John F., National Cottonseed Products Association, 19 S. Cleveland St., Memphis 4, Tenn.
Moore, N. Hunt, 1375 Madison Ave., Memphis 4, Tenn.
Moore, Robert L., Jr., American Mineral Spirits Co., 619 Plaza Bldg., Jackson, Miss.
Newby, Wales, Cotton Products Co., Inc., Opelousas, La.
Norris, F. A., Oil Mill Dept., Swift & Co., Union Stock Yards, Chicago, Ill.
Page, Bentley, Western Cottonoil Company, P. O. Box 191, Lubbock, Texas
Patterson, Robert F., Trenton Cotton Oil Co., Inc., Trenton, Tenn.
Perry, J. B., Jr., Mississippi Cottonseed Products Co., Box 1125, Grenada, Miss.
Picard, A. I., The Heyman Co., Inc., 316 Baronne St., New Orleans, La.
Roberts, L. E., De Soto Oil Co., 1180 Greenwood St., Memphis, Tenn.
Ross, James D., Jr., Lukens Steel Co., Coatesville, Pa.
Sale, O. H., Fertilizer Equipment Sales Corp., P. O. Box 1968, Atlanta, Ga.
Simmons, H. S., Mississippi Cottonseed Products Co., Kosciusko, Miss.
Sims, Edward C., Amory Cotton Oil Co., Amory, Miss.
Sims, Redding, National Blow Pipe & Mfg. Co., P. O. Box 67, New Orleans, La.
Sisson, Charles, Mississippi Cottonseed Products Co., Box 939, Jackson, Miss.
Smith, Allen, Perkins Oil Co., Memphis, Tenn.
Smith, C. T., Wurster & Sanger Co., 5203 S. Kenwood, Chicago, Ill.
Smith, K. B., Producers Cotton Oil Co., P. O. Box 1832, Fresno, Calif.
Speakes, Charles, U. S. Ginning Laboratory, Box 426, Leland, Miss.
Taylor, Dick, Southland Cottonoil Co., Box 742, Waxahachie, Texas
Tedford, D. A., Producers Cotton Oil Co. of Arizona, P. O. Box 1984, Phoenix, Arizona
Turner, K. Lanse, Cotton Research Committee of Texas, 215 E. Buckley, Brownfield, Texas
Verdery, M. C., Anderson, Clayton & Co., Cotton Exchange Bldg., P. O. Box 2538, Houston, Texas
Wamble, A. Cecil, Texas Engineering Exp. Sta., Texas A. & M. College, College Station, Texas
Wallace, C. A., The Union Oil Mill, Inc., West Monroe, La.
Weil, L. P., The Heyman Co., Inc., 316 Baronne St., New Orleans, La.
White, C. E., Planters Oil Mill, Tunica, Miss.
Wiley, A. L., Perkins Oil Co., Memphis, Tenn.
Woodruff, M. D., The Bauer Bros. Co., Springfield, Ohio
Woodruff, Ralph, Osceola Products Co., Box 192, Osceola, Ark.
Woodson, P. Frank, Woodson-Tenent Labs., Memphis, Tenn.

SUMMARY

(This summary of the conference was furnished on February 18, 1954, to trade and technical journals serving the oilseed industry.)

Cottonseed Clinic Stresses Production of Higher Quality Linters, Better Utilization

Resolutions looking toward more cooperative research in the oilseed industry and a closer tie with the USDA Southern Regional Research Laboratory were adopted at the Third Cottonseed Processing Clinic, held jointly by the Laboratory and the Valley Oilseed Processors' Association in New Orleans February 15-16, 1954. Industry representatives approved the following resolutions presented by J. B. Perry, Jr., Chairman of the Association's Resolution Committee, from the Mississippi Cottonseed Products Company, Grenada, Miss.

"1. BE IT RESOLVED: That a continuing broad research program is considered of major importance to the farmer, to the oilseed processing industry, and to the consumer, and that the Southern Regional Research Laboratory be highly commended for its efforts and achievements to date and that it be strongly urged to continue in further research and engineering development to improve the quality and yield of the products of the oilseeds of the South and to reduce, if possible, the cost of their manufacture. It is considered that one of the immediate problems is the cleaning of the raw cottonseed before manufacturing and the cleaning and improvement of the quality of the linters from cottonseed with a view to broader utilization of this product.

"2. BE IT RESOLVED: That the Research Committee of the Valley Oilseed Processors' Association as now constituted become a permanent organization to continue to cooperate with the Southern Regional Research Laboratory in the research program outlined in the preceding resolution.

"3. BE IT RESOLVED: That the members of the cottonseed processing industry in the Valley take this means of extending deep appreciation to the program chairmen, Mr. Fred M. Wells, and Mr. J.H. Brawner, and the members of their committees, as well as those who helped plan and are taking part in this program. Particularly do we express our thanks to Mr. Ralph Woodruff, President, and Mr. Clarence E. Garner, Executive Secretary, of the Valley Association.

"4. BE IT RESOLVED: That those attending this Oilseed Processing Clinic wish to extend deep appreciation to Dr. Charles H. Fisher and the staff of the Southern Regional Research Laboratory, with particular recognition to Dr. A. M. Altschul, Head of the Oilseed Section, and Mr. E. A. Gastrock, Head of the Engineering and Development Section, and their respective staffs for their fine contributions to the conference we are now concluding and for the many courtesies extended those in attendance."

Seventy-four representatives of cottonseed oil mills, equipment manufacturers, users of cottonseed products, and state and federal agencies, in addition to staff members of the Southern Laboratory, participated in the 2-day meeting. In his opening remarks Ralph Woodruff, President of the Association and Manager of the Osceola Products Company, Osceola, Arkansas, stressed the

importance of these Clinic meetings to the oilseed industry. He said:

"We have gotten a large measure of benefit from our studies and our work here (at the Southern Laboratory) and it has meant a great deal to us to come here. I am certain that for generations to come men in the oil mill business, as well as in other types of processing in the South, will be using profitably the services and facilities of this great Laboratory."

Major attention at the Clinic was focused on production and use of linters, which, over the past 10 years, have provided an average return to the farmer of $35,000,000, annually, according to J. F. Moloney, National Cottonseed Products Association, Memphis. J. W. Bremer, Jr., Swift & Company, Chicago, Illinois, stressed the need for exact laboratory methods for measuring linter quality to provide a yardstick for judging mill performance and to guide product utilization.

Mr. B. B. Annis, of Ward Voss and Associates, Memphis, Tennessee, stated that work is under way to develop a new type of linter which should overcome most of the objectionable characteristics of linters for paper manufacture. Preliminary tests show the tear test of paper made from this special linter to average 122 as compared with 86 for an average second cut, and that the fold test averaged 84 as compared to 40. Mr. Annis stated that the quality of the writing paper produced with cotton linters in 1952 enabled use of 57,800 bales of linters where there was a potential market of 278,793 bales.

Mr. J. H. Brawner, Chairman of the Sub Committee on Cottonseed Cleaning, spoke briefly concerning the apparent need for new types of see cleaning equipment employing new ideas and approaches to cleaning problems and re-emphasized the importance of making the best possible application of existing types of equipment. The best equipment layouts, capacities, and operating conditions for seed cleaning were summarized during a group forum and discussion period.

Mr. C. C. Speakes, U. S. Cotton Ginning Laboratory, Stoneville, Miss., said, "A major portion of the current research work on lint and seed cleaning is directed toward alleviating the stick problem. A stick and stem remover, developed through research on several principles of extraction, is now under test and further modification at the Stoneville and Chickasha laboratories. Although the machine was designed principally for snapped and stripped cotton, preliminary tests have indicated that there may be a place for the device in gins geared to handle machine-picked cotton. The construction of the machine is relatively simple, and should its effectiveness match expectations, it should prove a valuable addition to the modern well-equipped gin."

Mr. M. C. Verdery, Anderson Clayton and Company, Inc., Houston, Texas, spoke on "Developments on Seed Cleaning and Lint Cleaning in West Texas." Mr. Verdery said, "During the past several months we have made a much more careful investigation of sampling in connection with seed cleaning tests and find that by careful supervision, accurate and reasonably consistent results may be obtained. To determine the efficiency or 'percentage removal' of any seed cleaning machine, we recommend tests of relatively short duration so as to avoid, as much as possible, changes in seed quality or trash content."

Mr. M. E. Mann of the Williamson Northrup Company, while speaking on the "Desirable Characteristics in Linters for Various Markets" stated, "I believe that, on the whole, the mattress industry would use a great deal more first cut linters in their products if the staple were improved sufficiently to allow them to use first cuts which would run through the garnetts without excessive loss."

Mr. C. R. Campbell of the C. R. Campbell Company, Dallas, Texas, spoke on the use of basket type cleaners and stated, "it is my opinion that the mills can expect a larger percentage of rough seed as mechanical cotton harvesting increases, and we continue to get the usual bolly seed in the northern fringe of the Cotton Belt. The mill operators have the alternative of providing additional major seed cleaning machinery for the adverse condition of rough, bolly seed and by so doing creating an unsound economic burden when processing good seed, or providing supplemental cleaners to the existing equipment."

Mr. Allen Smith, of the Perkins Oil Company, Memphis, Tennessee, in his report on the jet-type cleaner observed that "You get the highest returns for your first cut linters by cutting the maximum amount possible -- because the price per pound does not decline in proportion to the gain in weight."

L. L. Holzenthal of the Southern Regional Research Laboratory reported on a survey being made by the Laboratory to obtain information on the extent and seriousness of the cotton cleaning situation, and the possibilities for its technical solution. He also presented a progress report and preliminary results of exploratory work on a traveling belt type of cleaner now being studied.

E. A. Gastrock and H. L. E. Vix of the Southern Regional Research Laboratory spoke on recent developments concerning the filtration-extraction process developed by the Southern Laboratory. In discussing the extension of the process to minor oilseeds of the South, Mr. Gastrock stated, "In processing a variety of oilseed materials, the filtration-extraction process presents a wide choice of favorable combinations of operating conditions. Thus it is possible to select for various oilseeds the processing conditions that favor economic and efficient operation and high product quality."

Dr. A. M. Altschul, Head of the Oilseed Section, SURB, in discussing newer knowledge about cottonseed processing as it affects the quality of oil and meal, resulting from the cooperative effort of the National Cottonseed Products Association, commercial, federal, and state laboratories, said "To continue to maintain a good competitive status with respect to soybean oil and animal fats, it is necessary for the cottonseed industry to produce the lightest colored oil it knows how, and to do it cheaply and with minimum loss. We now know as a result of work completed this last year that removal of gossypol during processing or immediately after production of the oil makes possible production of light colored oils." In addition, Dr. Altschul said "Within the last year the cottonseed industry was able to make definite statements that degossypolized cottonseed meal, i.e., cottonseed meal which has 0.04% or less free-gossypol can be fed safely to growing poultry and swine in unrestricted quantities. Such meals, however, cannot be fed to laying hens because they cause egg yolk discoloration in stored eggs." And further, "A meal, which has a free gossypol content of 0.04% or less and a nitrogen solubility in dilute sodium hydroxide of 75 percent or better might be expected to be called a meal suitable for extended utilization in brooder feed markets."

(The following paper was not given at the Clinic but is included in the Proceedings because of its information value.)

ADVANTAGES OF MAKING HIGH GRADE CHEMICAL LINTERS

By
W. D. Baldwin
Hercules Powder Company

The uses for chemical linters for the last fifteen years should be divided into two groups, non munition and munition. The non munition group requires the better grades, while all or most of the lower grades have been used in munition.

Munition requirements since the beginning of the last world war until recently have been very high. This permitted large quantities of lower grades to sell at prices for the better grades.

Since the cessation of fighting in Korea our stock pile of munition has just about been replenished, and requirements for this use will not be a factor in the linter market next season unless we become involved in another war.

The loss of this market for lower grades will increase the advantages of making high grade chemical linters, while the disadvantages of making lower grades will become greater than the mills have experienced in many years. Also, it appears the only way to compensate for this loss is to capture markets from competitive products. This will require better quality linters.

Anticipating this situation the three larger bleachers have for the last three to four years conducted an extensive research program for cleaning linters at their plants. They have made some progress, but it has not been sufficient to justify buying lower grades at market prices available for better grades.

Trying to clean 500 to 1000 bales per day at the bleaching plants after the mills have already cleaned it is obviously more difficult than better cleaning at the oil mills as produced.

The market situation justifies a careful investigation of the possibilities and economics involved in making cleaner chemical linters. Reviewing the following factors may be helpful to some mills: (1) Seed cleaning, (2) Linter cleaning, (3) Salvaging tailings, and (4) Delinting equipment.

Factor 1 - Seed Cleaning: The mills receive seed for cotton hand picked, machine picked, stripper harvested, snapped, field damaged and bollies. It is impracticable for mills to segregate these seed, consequently they have an uncontrolled blend with a very wide variation of trash.

The efficiency of seed cleaning equipment depends on the trash in seed, the load per unit, supervision and maintenance. However, the best equipment available is not adequate for the cleaning job required for the bulk of seed crushed.

The mills are well aware of this, and the best ingenuity in the oil mill and machinery supply industries are working on this problem. Some are trying to improve existing equipment and others are trying to develop new equipment.

Supplemental seed cleaning in front of each first cut linter machine where seed flow from the saws in a thin loose layer is a good place to remove trash which would otherwise reach the second cut machines. Trash going into these machines is converted into much finer trash that is difficult or impossible to thoroughly clean from linters.

I think the best unit now available for cleaning seed in front of the first-cut linter machines is the half drum basket cleaner developed by Bill Whittecar and Red Galloway at the Plains Cooperative Oil Mill, Lubbock, Texas. Also, that more attention should be devoted to cleaning seed at this point.

It is conceivable that considerable seed cleaning could be accomplished while conveying seed from the unloading point to storage if the proper combination of conveying and cleaning equipment could be developed. This would reduce the impacting of trash in the linters on the seed. The possibilities of this pre-storage cleaning should justify further investigation.

Factor 2 - Linter Cleaning: The best purification processes will not remove all the foreign, or non cellulosic, materials in raw linters. These materials control quality and influence the value of linters cellulose. The necessity of removing as much of them as possible at the oil mills has resulted in the use of the following linter cleaning equipment: (1) Linter beaters (Swartz, Fort Worth and Carver), (2) slotted cleaners (Cole-Taylor Cleaners), (3) slotted loops, and (4) Carver pneumatic cleaners for individual linter machines.

I don't know of any mill using all of this equipment, however, various mills are using the following combinations: (A) Carver pneumatics, beaters and slotted loops, (B) slotted cleaners, beaters and slotted loops, and (C) beaters and slotted loops.

The efficiency of these combinations is not adequate for making good quality when there is excessive field trash to be cleaned from the linters. Combinations A and B are more efficient than C. However, combinations A and B do a better job removing hulls than fine field trash. Combination A is doing the best job in the Mississippi Valley.

Obviously future research on linter cleaning should be concentrated on cleaning the thin mass of linters flowing from the individual linter machines instead of the heavier and denser mass accumulated from a group of machines. Also, field trash should be removed from the seed while the fibers are still attached to them instead of trying to clean it out of linters.

Factor 3 - Salvaging Tailings: Cleaning linters with a beater removes considerable fiber along with the trash. This mixture is called tailings and contains too much fiber to discard. So it is carried through additional beating and cleaning devices on the linter beater. However, salvaging the fiber from tailings returns a lot of trash to chemical linters, causing lower quality.

The total mass of linters cut with the first cut machines is run through beaters to clean and improve the color of first cut linters. I understand some mills beat out fifteen pounds or more per ton of seed as tailings. This means they are cutting fifteen pounds more than they are bailing. This heavier first cut produces shorter staple and may be reducing the value more than cutting only the quantity baled.

The present market trend for first cuts seems to be more value for a little better staple than a little better color. When the first cut beaters became popular, the trend was more value for a little better color than a little better staple. This reversal in the first cut market trend may be responsible for the large accumulation of first cuts on hand at mills now.

First cut tailings containing considerable to excess trash are diverted to chemical linters. These tailings have been responsible for much of the lower quality linters. It appears to be quite important at this time for the mills to check the economics of their present first cut and beater setup against the market trend for better first cut staple and cleaner chemical linters.

Eliminating trashy fibers accumulated at the scalping shakers, hull shakers, motes, sweepings, hammer mill machines and other sources from the linter beaters and cleaners would help considerably in salvaging cleaner tailings and improve quality of chemical linters.

Factor 4 - Delinting Equipment: Inadequate delinting equipment for making chemical linters while delinting to one to two percent linters left on seed has been responsible for a large portion of low grade linters. The trend has been to increase capacity by adding saws to the delinting cylinders, increasing saw speeds and adjusting for tighter seed rolls instead of using more linter machines.

This trend causes excess hulling in the linter machines and following are some of the results:

(A) Hulls in linters so excessive the beaters and cleaners cannot clean them out sufficiently for good quality. This is due mostly to quantity of hulls in the linters and partly because there is too much fiber left on them. Most of these hulls come from seed that were shattered before they were delinted.

(B) Moting out wooly hulls under the linter machines and in the beaters is more difficult than slick hulls.

(C) Oily content in linters excessive due to fine meat particles and oil absorption which lowers the cellulose yield.

(D) The potential penalty of linters rejected.

Sufficient linter machines would eliminate the problems caused by excess hulling and improve quality of chemical linters. The oil mill superintendents know more about the number of machines required and adjustments for them than I do so I am reluctant to suggest any definite specifications.

There are four major advantages of making high grade chemical linters as follows:

(1) Maintaining present markets for non munition products and cooperating in developing new markets for them. The markets for chemical linters have absorbed 65-70% of the total United States production of linters for several years. Any loss of these markets will influence values of other grades of linters.

(2) Assurance producers will not be penalized for low grades and rejections. The high munition requirements for the last fifteen years resulted in minimum penalties for these lower grades.

(3) A product that will not be difficult to sell on the best available market. Linters are bulky, requiring a lot of storage room and become quite a problem when they are hard to sell.

(4) The privilege of shipping as produced. With munition requirements reduced to a minimum the lower grades will undoubtedly have to be held for mill inspection before shipment.

In conclusion I suggest the mills pay special attention to the following points:

(1) Cleaning seed in front of the first cut linter machines.

(2) Cleaning linters at the individual linter machines.

(3) Using the slotted linter cleaner where practical.

(4) Using slotted loops and elbows to fullest advantage.

(5) Adjusting moting equipment for maximum linter cleaning. Fair to good motes usually sell for as much or more than chemical linters. It might pay some mills to use their first cut beater for cleaning motes and cut only the quantity of first cuts they are baling.

(6) Eliminate motes and miscellaneous trashy fibers (which should go to motes) from seed and linters going to equipment that makes and cleans chemical linters.

It may be possible for many mills to improve the quality of their chemical linters without sacrificing much, if any, cut per ton of seed.